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Baths and Washhouses in the English Public Health Agitation, 1839-48

EDWARD H. GIBSON, III*

It used to be said that the French wash their clothes but not their bodies; that the English wash their bodies but not their clothes. By the middle of the nineteenth century, however, the English working classes were washing both their bodies and their clothes in public washhouses. This is how the situation—developing with a rather surprising rapidity against the background of England's first public health agitation—came about.

The public health movement of this period was a gradual evolution of ideas, helped along by the agitation of individuals within Parliament as well as out of doors. On 19 August 1839 Charles James Blomfield, Bishop of London, offered in the House of Lords a motion calling for an inquiry as to the extent of the causes of disease enumerated in the Appendixes to the recently published Fourth and Fifth Annual Reports of the Poor Law Commissioners.[1] The motion was approved. For a decade thereafter the question of the public health of England was brought under the scrutiny of Parliament and the press by one inquiry after another. A widespread and intensive agitation for improvement of the public health ensued, culminating in the passage of the Public Health Act of 1848.[2]

A little noticed aspect of this agitation is the movement for public baths and washhouses, which only began in 1842, after the public health agitation had already received the stimulus of an inquiry conducted by Robert Slaney's Committee on the Health of Towns (1840) in the House of Commons.[3]

* Carson-Newman College, Jefferson City, Tennessee.

1 W. M. Frazer, *A history of English public health, 1834-1939* (London: Baillière, Tindall & Cox, 1950), p. 17; S. E. Finer, *The life and times of Sir Edwin Chadwick* (London: Methuen & Co., 1952), p. 163.

2 11 & 12 Vict. c. 63. Although the agitation which preceded the passage of this Act is frequently mentioned in books dealing with English public health in the nineteenth century, no detailed account of its progress either in Parliament or out of doors has been published since Sir John Simon's *English sanitary institutions*, the second edition of which appeared in 1897; a brief outline of the principal events may be found in this classic. The agitation is only briefly sketched in Miss B. L. Hutchins' *The public health agitation, 1833-48* (London: A. C. Fifield, 1909, 150 pp.).

3 Parliamentary Papers, 1840, xi, *Report of the select committee to inquire into the circumstances affecting the health of the inhabitants of large towns and populous districts, with a view to improved sanatory regulations for their benefit*, p. ii.

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The quantity of the literature on balneology published in England before 1842 would indicate that most well-to-do people were convinced of the therapeutic values of the mineral waters of the British Isles. Bath was merely one of some 190 watering places to which the upper classes could repair.[4] That the sick poor could also benefit from the medicinal baths available to the rich seems to have been almost completely overlooked. Professor Mullett records the founding of The Sea Bathing Infirmary at Westbrook in 1796, at which its director and other medical men supplied advice and medicines gratis to the poor, and a similar infirmary established at Margate soon afterward.[5] These seem, however, to be isolated examples.

Similarly, opportunities for bathing in ordinary water for comfort, cleanliness, and health were not available to the poor, although the well-to-do could usually enjoy a limited supply of water piped in to their residences from the mains of the large water companies.[6] For ordinary bathing there were, it is true, public baths in London and some of the larger towns, privately owned and operated for private profit. Gone, however, were the popular municipal baths of the middle ages.[7] Bathing at even the cheaper of the public baths of nineteenth century England before 1842 was a luxury the working classes could ill afford. Although a workman signing himself "A Journeyman Carpenter" asserted in a letter to *The Times* that it was a fallacy that the working classes could not afford the use of the available public baths (privately owned), and that what was lacking was merely the disposition toward cleanliness, this was quickly refuted by other workingmen who wrote in to say that this mechanic, with his wages of thirty shillings per week, could do what to most workmen was a financial impossibility.[8]

Here and there some effort was made to extend bathing facilities to the poor. For example, a private company in Leeds offered the working classes a large swimming bath in 1842 at the modest fee of

4 Charles F. Mullett, *Public baths and health in England, 16th-18th century* (Suppl. No. 5, *Bull. Hist. Med.* [Baltimore: The Johns Hopkins Press, 1946]).

5 *Ibid.*, p. 37.

6 See, for example, advertisement of a Manchester merchant offering shower baths, complete with curtains, and a varied assortment of slipper, Athenian, nursery and other baths, *Manchester Guardian*, 20 July, 1844.

7 See Lynn Thorndike, "Sanitation, baths, and street-cleaning in the Middle Ages and the Renaissance," *Speculum*, 1928, *3*, 192-203. Varron suggests that public baths declined in popularity and all but disappeared because their original purpose of contributing to health was in time subordinated to amusement and questionable entertainment (A. G. Varron, "Hygiene in the medieval city," *Ciba Symposia*, 1939, *1*, 205-14).

8 *Times* (London), 22 October, 1844. The public bath used by this workman was in City Road, Holborn, and its fee was 6 *d.* See reply to this letter by "A Mechanic," *Times* (London), 23 October, 1844. Other letters to the editor at this time also protested the charge that workingmen had no desire to be clean.

2 *d.*, but the bath was open only one day each week.[9] And a privately owned public bath in Westminster had a rate of 3 *d.* for the humbler classes.[10] But these were the exceptions that proved the rule that public baths were not generally available to the working classes before 1842.

The truth of this generalization is indicated by the following data compiled from the surveys instituted in 1844 and 1845 by the Commissioners for Inquiring into the State of Large Towns and Populous Districts.

Locality	*Public Baths (privately owned) with fees of 6 d. or less*	*Bathing permitted in nearby rivers, canals, or pools*	*Public Baths operated by Charities or Local Govt.*	*Ref., p.*
Birmingham	none	no	none	25*
Bor. of Wolverhampton	none	no	none	30
Twn. of Wednesbury	none	yes	none	31
Twn. of Wallsall	none	no	none	33
Twn. of Billston	none	no	none	35
Twn. of Dudley	none	yes	none	38
Twn. of W. Bromwich	none	no	none	40
Twn. of Kiddermaster	none	no	none	42
Twn. of Stourbridge	none	no	none	43
Twn. of Burslem	none	no	none	44
Twnshps. of Hanley and Shelton	none	yes	none	46
Twn. of Longton	none	no	none	48
Newcastle-under-Lyme	none	yes	none	49
City of Chester	none	yes	yes	51
Twn. of Shrewsbury	none	no	none	54
Twn. of Wrexham	none	no	none	56
City of Gloucester	none	yes	none	57
City of Bristol	cold swimming baths only	yes	none	72
Twn. of Frome, Somerset	none	yes	none	124
Twn. of Swansea	none	sea-bathing	none	133
City of Bath	none	no	yes	111-14

* Page references are to Parliamentary Papers, 1845, xviii, *Second Report of the Commissioners for Inquiring into the State of Large Towns and Populous Districts*, Appendix—Part I.

Certain exceptions should also be noted in the foregoing tabulation. The rivers and canals in which bathing was permitted were

[9] J. L. and Barbara Hammond, *The age of the chartists, 1832-1854* (London: Longmans, Green & Co., 1930), p. 101.

[10] Parliamentary Papers, 1842, xxvi, *General report on the sanitary condition of the labouring population of Great Britain*, p. 255.

often polluted. The old lime-pits used at Wallsall in defiance of a local ordinance were dangerous, as was the river at Gloucester. Although baths were made available at the Infirmary and Poorhouse in Chester, the fees were beyond the reach of the working classes. Bristol had only cold swimming baths at fees the poor could pay. One medicinal bath known as "Hospital Bath" was open to the poor in the City of Bath, but only on a certificate from a surgeon.

It was likewise impossible for the working classes to bathe regularly at home, nor could they effectively launder soiled clothing in the overcrowded tenements in which most of them lived. A vivid description of these difficulties was to appear in 1844 in the First Report of the Commissioners for Inquiring into the State of Large Towns and Populous Districts; but before that date the popular movement for public baths and washhouses for the poor had already begun. This report would offer proof as well that the medical profession was thoroughly convinced that cleanliness of person and clean dwellings and clothing were essential to good health among the working classes.

Liverpool enjoyed in this period the double distinction of initiating the public bath and washhouse movement in England and of sponsoring the first institution of the kind built and operated through funds supplied by the borough Corporation rather than a charitable organization. This establishment was opened in Upper Frederick Street in 1842.[11]

The idea, however, seems to have originated in the charitable activities of Mrs. Catherine (Kitty) Wilkinson, who opened the kitchen of her home in a poor quarter of the borough to victims of the cholera outbreaks of 1832 and 1834. Here her poor neighbors were permitted to wash their soiled clothing while struggling to nurse sick members of their families through the worst stages of the epidemic. William Rathbone saw the benefits of such a provision and induced the Corporation to undertake the building of a public bath and washhouse to serve the people at rates the working classes could afford to pay.[12]

11 W. M. Frazer, *op. cit.*, p. 20, note; Parliamentary Papers, 1844, xvii, *First Report of the Commissioners for Inquiring into the State of Large Towns and Populous Districts, Appendix*, pp. 195-7. A full description, including plan of the Liverpool Baths will be found here.

12 Hammond, *loc. cit.*; see also Ramsay Muir, *A history of Liverpool* (London: Williams & Norgate, 1907), p. 311, and H. R. Rathbone, *Memoir of Kitty Wilkinson* (1927). William Rathbone (1787-1868) was active in civic and charitable work in Liverpool at this time. During the Irish famine of 1846-7 he had sole charge of the distribution of some £70,000 contributed to Irish relief funds by the people of the New England states (*Dict. Nat. Biog.*, XVI, 753).

A somewhat different development next took place in Edinburgh, where the workingmen themselves undertook in 1844 to raise funds for the construction of baths and washhouses. A public meeting on the subject was held in the Music Hall, George Street, attended by the Lord Provost, Lord Dunfermline, William Pulteney Alison, M.D., and other prominent figures of Edinburgh.[13] Alison was a well-known champion of the theory that destitution and disease have a close relationship, and the news account of this meeting emphasized the intimate connection between personal cleanliness and good health.

> We need not point [ran the article] to the strong recommendations of bathing in the works of our medical men. There is not a dissentient voice on that subject. . . . [If the baths are built] one thing is certain, that we shall have those epidemical scourges which every now and then visit us with such cruel effect mitigated in their virulence, if we cannot banish them altogether . . .[14]

The campaign was successful. A news item of 8 August 1844 reported the laying of the cornerstone of the new building. On this occasion a piece of plate was presented to James Simpson, whose lectures and writings on education were said to have created a desire for this improvement among the working classes.[15] In November another public meeting, attended by a numerous assemblage of all classes, was held in the Hopetown Rooms, Queen Street, with the object of raising additional funds. The Duke of Buccleuch served as chairman of this meeting and himself subscribed a hundred pounds to the fund.[16] Buccleuch's rôle in this voluntary movement is of special interest since he was chairman of the Commissioners for Inquiring into the State of Large Towns and Populous Districts, a royal commission created by letters patent on 9 May 1843. The Commissioners' First Report had already appeared under date of 27 June 1844, constituting a powerful propaganda weapon in behalf of sanitary reform. Although specific recommendations for sanitary reform were reserved for the Commissioners' Second Report, issued in 1845, the First Report included a detailed description of the baths already opened under municipal auspices in Liverpool in 1842.

13 *Scotsman*, as quoted in *Times* (London), 3 January, 1844. James Abercromby (1776-1858), first baron of Dunfermline, was elected Speaker of the House in 1835. On his retirement in 1839 he devoted himself thereafter to civic and educational improvements in Edinburgh (*Dict. Nat. Biog.*, I, 40). Alison was a celebrated Professor of Medicine in the University of Edinburgh (*Ibid.*, p. 290).

14 *Times* (London), *loc. cit.*

15 *Morning Chronicle* (London), 8 August, 1844.

16 *Caledonian Mercury*, as quoted in *Morning Chronicle* (London), 23 November, 1844.

It is not clear who first proposed the building of public baths and washhouses in London. As early as 1842 an anonymous resident of Mile End Road proposed in a letter to *The Times* that such baths be built on land recently granted by the Queen for a new park. This was some 290 acres, lying between the Regent's and Sir George Duckett's canals, upon which was subsequently established Victoria Park.[17]

Nothing came of the proposal to use the nearby canals as a water supply for baths, and it was not until October of 1844 that effective steps were taken to establish public baths and washhouses in London. These came about through the efforts of a group of prominent people who saw in the bath and washhouse movement an opportunity to ameliorate those evils on which Parliament had by now spent five years of investigation without achieving a legislative remedy. The result was the forming of an Association for the Establishment of Baths and Washhouses for the Labouring Poor, which became known as the parent committee of the movement in London.

On 14 October William Cotton, who had been liberal of his time and funds in providing additional churches for the working classes of Bethnal Green and was at the time Governor of the Bank of England, held a preliminary committee meeting at Mansion House to plan the details of a large formal gathering in behalf of the bath and washhouse movement in the metropolis.[18] The formal public meeting began at two o'clock 16 October 1844, in the Egyptian Hall of Mansion House under the chairmanship of the Lord Mayor.[19] The large assemblage of eminent people on the platform included Lord Dudley Stuart; George Byng, M. P. for Middlesex; John Campbell Colquhoun, M. P. for Newcastle-under-Lyme; Sir W. Clay, M. P. for Tower Hamlets, who had been a member of the Select Committee of the House of Commons on the Improvement of the Health of Towns in 1842; Alderman Sir J. Pirie; Alderman W. Hunter; Alderman Sidney; Mr. Moon, the former sheriff; Mr. D. Salomons;[20] William Cotton; Mr. R. B.

17 *Times* (London), 8 June, 1842.

18 *Ibid.*, 15 October, 1844. For Cotton's church charities, see A. Blomfield, *A Memoir of James Blomfield, D.D., Bishop of London* (2d ed., London: John Murray, 1864), p. 181.

19 *Times* (London), 17 October, 1844.

20 Sir David Salomons, Bart. (1797-1873), Lord Mayor of London in 1855; his benevolent and charitable activities had begun as early as 1835, when he was chosen a sheriff for London and Middlesex. He was later elected to Parliament, where his views on financial matters carried great weight (*Dict. Nat. Biog.*, XVII, 700).

Seeley;[21] Archdeacon Wilberforce; Archdeacon Hale; the Reverend Mr. D. Russell; and a large number of other clergymen and laymen. The news report of the meeting records that several women were present, but unfortunately it does not give their names.

The Bishop of London[22] had been selected to make the principal address. The choice was a wise one, for it assured an able presentation of the facts by an eloquent speaker who would fearlessly and conscientiously champion the cause of the poor with whose living conditions he had had long and intimate acquaintance. And this the Bishop would do despite the taunts of his detractors—both within and without the church—who could never forget the princely income at his disposal. Bishop Blomfield first stated the purpose of the meeting and then proceeded to explain in a lengthy address the need of public baths and washhouses in London by describing in detail the conditions under which the working classes lived.

The Bishop voiced a sentiment that had by then become a refrain on the lips of all the sanitary reformers: only the clergy and medical men could comprehend the misery and degradation masked by the splendid front of London's great streets. As to the moral effects of these conditions among the working classes, Blomfield referred to the testimony of Dr. Southwood Smith that the natural result was "the formation of habits of idleness, dishonesty, debauchery, and violence."[23]

Bishop Blomfield considered the efforts of workmen to launch a bath and washhouse movement in Edinburgh a laudable venture. But he feared that the limited housing of London and other great towns, and the reluctance of landlords to amend this state of things, would prevent any immediate improvement. Under these circumstances, he thought that voluntary efforts on the part of those inclined toward benevolence were imperative.

The parish of St. Giles's,[24] said the Bishop, always came to mind when one thought of the most wretched districts of the metropolis. Great improvements had been carried on there recently, but with what result?

21 Robert Benton Seeley (1798-1886), publisher and author, one of the founders of the Church Pastoral Aid Society in 1837 and of the Society for Improving the Condition of the Labouring Classes in 1844. He supported the Earl of Shaftesbury in the latter's fight for factory legislation. In 1856-57 he was a member of the Metropolitan Board of Works (*Dict. Nat. Biog.*, XVII, 1131).

22 Charles James Blomfield.

23 As quoted by Blomfield, *Times* (London), 17 October, 1844.

24 St. Giles's was a small parish next but one to the western boundary of the City of London.

. . . many thousands had been displaced from their wretched hovels, which had been nests of filthiness and crime. . . . Those parts which were before overcrowded became more overcrowded. Houses which had every room occupied before by one family now had two families in each room.[25]

And the speaker pointed out that in addition to living, eating, and sleeping in such crowded quarters the poor had also to wash their clothes in the rooms. The resulting dampness was especially hard on the sick. Yet even well persons were unable under ordinary circumstances to wash their clothing properly. Often they washed their linen in dirty water, in water already used.

The Bishop further stated it to be a fact that ". . . to a large extent, as a substitute for soap, those poor persons would use articles too disgusting to be named; and consequently the linen when washed was more infectious than before."[26]

For another aspect of the problem the Bishop quoted Dr. Joseph Toynbee, the surgeon whose testimony had been included in Chadwick's Sanitary Report of 1842:

To mothers who are debilitated, the carrying of water up stairs when the rooms inhabited are on the second floor, is a great exertion. Sick children have been neglected and left dirty, from the inability to fetch the water. One source of dampness and smell is the vessels of dirty water retained in the rooms.[27]

Bishop Blomfield saw no remedy for these situations at the time beyond the provision of public baths and washhouses.

Suppose [said the Bishop] they were supplied with water in their own poor lodgings, that would have to be paid for, and would cost more money than the washing establishments, without giving the poor woman the use of fire, the use of a drying-room, the use of utensils, or the means of ironing or mangling.[28]

25 *Times* (London), 17 October, 1844.

26 *Ibid.* Blomfield was undoubtedly referring to "wash," specifically urine kept in stone bottles until very strong and then used in washing clothes. Some of the poor considered it a more effective cleanser than soap for woolens, flannels, and kitchen towels; but Dr. Reid, who reported on this practice in Sunderland, commented that it was used not in order to soften water but as a substitute for soap, which the poor could ill afford because of its high price. See Parliamentary Papers, 1845, xviii, *Second Report of the Commissioners for Inquiring into the State of Large Towns and Populous Districts,* Appendix—Part II, pp. 195-6. There was considerable agitation for repeal of the soap duty in the interests of the poor. See *Morning Chronicle* (London), 5 April, 1838. But the duty was still in force when the soap industry itself unsuccessfully advocated repeal in 1844 (*Times* [London], 9 December, 1844).

27 *Times* (London), 17 October, 1844. Joseph Toynbee (1815-66), M. D., studied anatomy under George Derby Dermott at the Little Windmill Street School of Medicine, and at this time was well known as an aural surgeon. He was among the first to be nominated to the new order of Fellows established by the Royal College of Surgeons of England in 1843. But he was equally well known as an advocate of improved sanitary conditions and was often quoted for his ardent championship of improved housing for the poor (*Dict. Nat. Biog.*, XIX, 1065).

28 *Times* (London), 17 October, 1844.

Some had objected that crowds of housewives among the poor ought not to be permitted to mix together in large numbers.

> What great matter [said the Bishop] if they did talk over each other's grievances? . . . It could not have the effect of rendering them or their husbands less domestic by making their homes more comfortable and attractive—improving their health and their respectability.[29]

In Liverpool, said the Bishop, such baths had been in operation nearly two years, with the result that the Corporation of Liverpool had determined to erect an additional public washhouse.

The address of the Bishop was enthusiastically received by his audience and a resolution passed for the organization of an association to collect and administer funds. George Byng urged that the association solicit contributions of any amount from all classes of people. And Archdeacon Wilberforce met the objection that the provision of public baths and washhouses would tend to make the poor lose their self-reliance, by pointing out that it was simply impossible for the poor to do these things for themselves. The poor were not indifferent to uncleanliness—they were merely patient. As for the objection that the Association was beginning at the wrong end—that housing, for example, should be corrected first—his answer was that the plan for baths and washhouses was practicable; this, at least, could be accomplished at once.[30] "If he were to use a selfish argument [said the Archdeacon], he should say that the improvement of the poor was the most effectual mode for protecting the possessions of the rich."[31]

Whether all concurred in this sentiment cannot now be ascertained. In any case, the Bishop of London was unanimously elected President of the Association and the Lord Mayor, Samuel Jones Loyd (afterward Baron Overstone), Abe Smith, and Anthony de Rothschild were elected trustees.

William Cotton made an interesting comment on the origin of the movement:

> He disclaimed any merit in himself. . . . He had found that a great number of gentlemen claimed the merit of originating this scheme; he had thought of it 30 years ago, but he would not dispute about it, being delighted to find so many anxious to promote it.[32]

On this point, *The Times* claimed in November that it was the

29 *Ibid.*
30 *Ibid.*
31 *Ibid.*
32 *Ibid.*

first to draw attention to the public bath and washhouse scheme and had subscribed a hundred guineas to promote it.[33]

The *Morning Chronicle,* like *The Times,* gave over three columns to its news account of this meeting. The former commented that the meeting "may be hailed as evidence of the deep impression made by the revelations in the Sanitary Report,"[34] and *The Times* asserted that the contention that "the poor love dirt" was a foul slander on the working classes; and, for the rich who were taken in by that notion, the newspaper read them an amusing short sermon:

> Take for instance [ran its editorial], the House of Lords, probably the cleanest assemblage of men which could be found; condemn them to cold water and no soap, and to wash all their own clothes with their own hands in their own drawing rooms for a single twelve-month, and how would they look at its termination?[35]

In a period noted for the founding of a wide variety of new benevolent organizations, the attitude of *The Times* toward the Egyptian Hall meeting is significant:

> We augur well [concluded the editorial] from the spirit with which the matter has been taken up. . . . There was no talk of driving the poor to emigration with a bellwether of a "clever farmer's son" at their head. Instead of telling them to go to Canada and wash in Lake Erie, it was determined that means should be provided by the rich for enabling the poor to wash and make themselves comfortable at home. . . . The city meeting was set for doing and not for mere palaver. . . .[36]

It is with difficulty that one can now comprehend the objections raised against the bath and washhouse movement in 1844. Mr. Luke Hansard had contributed to the funds of the Association;[37] yet he wrote in sincere concern regarding the injury public washhouses might do to the "numerous class of washerwomen," and suggested a resolution recognizing the principle of independence of the working classes by means of their own honest industry.[38] Another letter to the editor insisted that the poor were too degraded by poverty to use the baths; poverty was a condition that must first be removed.[39] An article in *The Builder* solemnly warned that the proposed sinking of artesian wells to supply the baths with pure

33 See editor's comment in a footnote to a news article on the public bath and washhouse movement in Birmingham (*Times* [London], 20 November, 1844).

34 *Morning Chronicle* (London), 17 October, 1844.

35 *Times* (London), 18 October, 1844.

36 *Ibid.*

37 *Ibid.*, advertisement of the Association.

38 News note and comment, *Times* (London), 17 October, 1844.

39 *Ibid.*, 12 October, 1844, letter signed "E. H. Malcolm."

water would cause the contraction of the clay beds on which London's buildings rested, with resultant damage to their foundations.[40] Still another letter warned that the machines for laundering clothes, recently exhibited at the Polytechnic Institution, would wear out the garments of the poor more quickly and thus be a detriment rather than a help to this class of people.[41]

But contributions to the London movement continued to be generous, including handsome gifts from the Queen, Prince Albert, and the Queen Dowager. In November the number of trustees was enlarged, an executive committee under the chairmanship of William Cotton was set up, and James Farish and John Bullar became Honorary Secretaries. George Stonhouse Griffith was made Assistant Secretary.[42] By December of 1844 the Association had raised 6,500 pounds and had evolved an ambitious plan for establishing four public baths in London.[43]

It was estimated that the first of these would cost between seven and ten thousand pounds, and it was decided to ask the aid of the Corporation of the City. Accordingly, a deputation headed by William Cotton waited upon the Coal, Corn and Finance Committee and petitioned a modest grant of 500 pounds, conditioned upon the opening of the first model establishment to be built by the voluntary organization. The grant was promptly opposed.[44]

Mr. W. Lawrence was probably typical of those members of the Court of Common Council who fought the grant. His first argument—which helped to set the face of the Council against the bath and washhouse movement in London—likewise provided the tragedy lived out daily by the poor of the metropolis with its comic relief: the argument that good women would be associated in these public establishments with the most abandoned of their sex.

"Could it be supposed," unctuously observed Mr. Lawrence, "that the wives and mothers who were to be subjected to such contamination would long continue pure and virtuous?" The washhouses, he contended, would not be merely "gossip-shops" but veritable "sinks of corruption." Moreover, bathing was not, as some imagined, "an article of necessity" to good health.[45]

Gathering confidence from the cries of approbation and the good humor of his audience, Mr. Lawrence went on to assert that

40 *The Builder*, as quoted in *Morning Chronicle* (London), 7 November, 1844.
41 *Times* (London), 25 October, 1844.
42 *Ibid.*, 9 November, 1844, advertisement of the Association.
43 *Ibid.*, 20 December, 1844.
44 *Ibid.*
45 *Ibid.*

> Many a poor woman was there who would not be seen within a gin-shop, but if wash-houses were to be established, the objection would soon be destroyed by the gossip of three or four companions of the wash-house, who, upon their return from the work, would say amongst each other, "Wouldn't a drop of gin be comfortable after our labor? (a laugh and cries of 'Hear, hear.')" How if the mother of a family were to go to a distance to obtain the accommodation, was her husband's dinner to be provided?[46]

Mr. Lawrence could not, indeed, "commit himself to a crusade against the virtuous poor." But the Court of Common Council was evidently less concerned over the moral question than Mr. Lawrence: it refused the original sum requested by the Association and voted a grant of 200 pounds instead.[47]

Shortly after the founding of the Association the executive committee opened a competition for the best architectural designs for the first establishment. Of twenty-two submitted, the committee adopted the plans of Mr. P. P. Baly.[48]

While the Association was continuing its campaign for funds and supervising the erection of the model establishment in Goulston Square, Whitechapel, The Committee of the Houseless Poor took up the idea and put it into immediate execution for the inmates of the Eastern Asylum for the Houseless Poor which it was then operating for destitute transients in Glasshouse Yard.[49] The experiment was enthusiastically received by the transients, but the Committee soon discontinued the asylum, placing the building and its boiler, tanks, tubs, and drying-closet at the disposal of a newly formed Association for Promoting Cleanliness amongst the Poor, which operated the establishment after May of 1845 as a bath and washhouse at which the necessitous were permitted to bathe and wash their clothing without charge. Small amounts of soap and washing soda were also furnished gratuitously.[50]

The Association for Promoting Cleanliness amongst the Poor was an offshoot of the parent association organized at the Mansion House meeting of 16 October 1844.[51] It was dependent, however, on separate subscriptions for its support and had its own bankers in the firm of Williams, Deacon & Co., Burchin Lane.[52] Its Glasshouse establishment proved to be very popular with the working

46 *Ibid.*
47 *Ibid.*
48 *Ibid.*, 18 February, 1845.
49 *Ibid.*, 7 November, 1845. Glasshouse Yard was sometimes called Glasshouse Street in this period. Its location was near the entrance of the London Docks (*Times* [London], 1 May, 1847).
50 *Times* (London), 7 November, 1845.
51 *Ibid.*, 1 May, 1847.
52 *Ibid.*, 19 September, 1845.

classes. During the first year of operation there was a total of 67,664 patrons.[53] Destitute women were supplied with a temporary dress while they washed and dried the only garments they could call their own, and materials for mending were furnished gratis in addition to soap and soda.[54]

On 1 November 1844 the parent association from its office at 3 Crosby Square addressed a letter to the Marylebone Vestry suggesting the establishment of a public bath and washhouse in the northwestern district of the metropolis.[55] It is not clear whether anything came directly of this proposal. However, on 5 February 1845 a well-attended meeting of the clergy and influential gentry of the adjoining parish of St. Pancras was held at the vestry rooms, Gordon Square, for the purpose of establishing a bath and washhouse in the neighborhood of St. Pancras, a parish said at the time to consist of at least 130,000 souls, most of them of the working classes. This was an outgrowth of a communication of the parent association. A local committee had already approved the formation of a branch society in St. Pancras, and it recommended an urgent appeal to the residents to furnish it with funds. The meeting adopted the report of the committee and resolved that deputations should wait upon the Duke of Bedford, the Marquess of Camden, Lord Southampton, Lord Somers, and other great landed proprietors of the district in order to obtain their co-operation.[56]

The subscription campaign of the St. Pancras society was successful, and by October of 1845 construction of the new buildings had begun in George Street, Euston Square. The site was given by the New River Company at a nominal rental accompanied by an offer to supply the establishment with fresh water free of cost for the first six months and at the lowest possible cost thereafter.[57]

The new building in George Street was described as about 800 feet in length around three sides of a square.[58] Construction proceeded slowly but steadily, and it was not until 3 August 1846 that the new buildings were opened to the public.[59] It was thus not the first public bath and washhouse for the working classes to be opened in London. Nevertheless, it was the first complete establishment

53 *Ibid.*, 1 May, 1847.
54 *Globe*, as quoted in *Times* (London), 15 May, 1846.
55 See letter quoted in *Times* (London), 13 November, 1844. The parent Association was subsequently known as the Central Society for the Establishment of Baths and Washhouses for the Labouring Classes.
56 *Times* (London), 6 February, 1845.
57 *Ibid.*, 18 October, 1845.
58 *Ibid.*
59 *Ibid.*, 13 January, 1848.

to be designed and constructed in building and equipment throughout for the specific purpose in the metropolis. The report of its committee of management shows that from its opening until 8 October 1848 it accommodated 281,418 bathers and 93,430 persons who washed, ironed, and dried their laundry.[60] Thus the popularity of the St. Pancras establishment was little short of amazing, inasmuch as an average of over 400 bathers per day during week days used the facilities. No better proof could be offered that the poor of this period desired personal cleanliness and would avail themselves of the opportunity when it was within their means to do so.[61]

The establishment then under construction by the parent association in Goulston Square, Whitechapel met with difficulties in excavating and draining cesspools under the foundation site. Further delay arose over the problems of design and construction encountered by the engineer, P. P. Baly. It was the intention of the Association to make this building a model, avoiding the mistakes in architectural design which could be expected in a pioneer work of this kind, to the end that branch associations would be able to erect the most efficient buildings at lowest possible cost.[62] Consequently much time was spent on revision of plans for water tanks, clothes-drying closets, and the like. Messrs. Copeland and Garrett, for example, were engaged in making an entirely new tile of white glazed ware for lining the baths.[63] Thus it was not until 18 July 1847 that the model establishment was opened for inspection in Goulston Square.[64]

The Glasshouse Yard, St. Pancras, and Goulston Square baths were originated and financially supported through the voluntary efforts of philanthropists fostered by the associations already named. Contributions were generous from all classes. But as the project expanded it became apparent to the central Association that the aid of Parliament must be enlisted to provide a legal basis for the assumption of the task by local government.

On 8 June 1846, therefore, the President of the Parent Association presented five petitions to the House of Lords. Of these one came from the Association. The other four included one signed by the heads of more than one hundred important firms of merchants

[60] *Ibid.*, 6 November, 1848.

[61] Charges to the laboring man had been kept at a minimum. A cold bath was a penny; a warm one, including use of a towel, was only 2 *d.* Yet in January of 1848 the institution had liabilities of only £ 874.11.0.

[62] *Times* (London), 2 May, 1846.

[63] *Ibid.*

[64] *Ibid.*, 19 July, 1847.

and bankers in the City; another by the chairman of the London Dock Company, which employed several thousands of workers; another by the churchwardens, overseers, and guardians of the parish of St. Martin's-in-the-Fields; and still another signed by 121 of the parochial clergy of London.[65]

With such support and, what was even more important, without serious opposition on the part of the vested interests of London, Sir George Grey was able to introduce a Public Bath and Washhouse Bill in the House of Commons. The object of the Bill was to enable parishes, where there was the desire to erect such an establishment, to obtain the first cost of the building out of the poor rate, for this purpose borrowing money on the security of the rates, the loan to be paid off in a stipulated number of years. The power to be given to parishes and town councils was purely permissive. There was no opposition in the House and the Bill passed without debate 24 July 1846.[66]

In the upper House the most serious objection was raised by Lord Brougham, who insisted that the Bill was wrong in principle on the grounds that the poor rate had never been intended for any other purpose than the sustenance of the poor.[67] But two things worked in favor of the Bill. On second reading the Marquess of Lansdowne asserted that no less than 9,000 of the poor had walked three to five miles from their homes to use the Glasshouse Yard bath and washhouse; and that the power in the Bill enabling corporations and vestries to buy out private establishments and convert them to public use at moderate rates would be used only where private enterprise had failed to meet the demands of the public. Perhaps of greater influence was the clause in the Bill providing that public baths were not to be erected for the exclusive use of the poor.[68] Thus patronage by tradesmen and others of the lower middle class would serve to assure operation without financial loss to the sponsoring local government. In any case the Bill was passed by the House of Lords on 7 August 1846.[69]

Perhaps the most zealous sponsor of this Bill was Sir Henry Dukinfield, Bart., since the measure at once became known as Dukinfield's Act.[70] Sir Henry was vicar of the parish of St. Martin's-in-the-Fields, and an immediate outcome of the Act was the con-

65 *Hansard*, 8 June, 1846, LXXXVII, cols. 104-105, House of Lords.
66 *Ibid.*, 24 July, 1846, col. 1404, House of Commons.
67 *Ibid.*, 28 July, 1846, LXXXVIII, cols. 104-105.
68 *Ibid.*, 3 August, 1846, cols. 277-9.
69 *Ibid.*, 7 August, 1846, col. 371.
70 *Times* (London), 10 June, 1846, editorial.

struction of "The Baths and Laundries of St. Martin's-in-the-Fields" in Orange Street, Leicester Square, on a site adjoining the National Gallery. St. Martin's thus enjoyed the distinction of being the first parish to erect public baths under the new Act. By this time the model Bath and Laundry in Goulston Square, Whitechapel, had been opened, providing solutions to the problems of design which were incorporated into the St. Martin's Bath. Hull is said to be the first borough, as St. Martin was the first parish, to adopt Dukinfield's Act.[71]

Dukinfield's Act of 1846 was amended the next year. There were many small tradesmen who, while needing public bathing and laundering facilities scarcely less than laborers, were nevertheless class-conscious and reluctant to patronize the public baths. The object of the amending Bill was to enable local governing bodies to furnish additional facilities, at slightly higher fees, for this portion of the population. It became law on 2 July 1847.[72]

The public bath and washhouse movement proved immediately popular with the working classes from its inception in 1842. It was no less attractive to the politician, who found in this—for the first time—a measure of public health that drew only a feeble protest from vested interests. Likewise it but faintly aroused the fears of those who cherished local self-government and private enterprise above all other considerations. Moreover, the public bath and washhouse soon proved its capacity as a revenue-producing institution that the ratepayer had little reason to fear. Thus it is not surprising that the Act of 1846 was duplicated and made applicable to Ireland without any debate whatsoever, receiving the royal assent on the same day as the measure applying to England.

For these reasons the public bath and washhouse persisted in public favor for many years while sewerage, drainage, water supply, and housing were to remain unsolved problems in the metropolis and many of the most populous manufacturing towns. The great Public Health Act of 1848 did not apply to London; and though its provisions came into operation in some of the provincial towns, many populous districts were able to evade responsibility for sanitary reform as late as 1875. It is not too much to say, therefore, that the public bath and washhouse movement was able to render a prosaic but useful service to thousands who waited in vain for a pure water supply and drainage laid on in the dwellings of the poor.

[71] *Ibid.*, 19 June, 1846.
[72] 10 & 11 Vict., c. 61.

The Illness of Charles, Duke of Albany (Charles I), from 1600 to 1612

An Historical Case of Rickets

J. J. KEEVIL*

BEFORE accepting the statement that a disease first manifested itself at a certain date, two very human motives for the assertion should be considered: it may have been made by physicians of limited experience to account for their never having noted anything similar before, or to explain the ineffectivness of their treatment—"*Medici errori plebeculae faventes hunc affectum* the new disease *novum morbum appellavere,*" wrote Sir Theodore de Mayerne[32] to account for the views of some physicians during the typhoid epidemic in England in 1612. Another possibility is that the condition was so widespread that by contemporary standards it came to be regarded as within normal experience until someone noted that it was limited to certain groups of people. Finally, the disease may for centuries have been confused with a condition closely resembling it, and been called a new disease only when it was distinguished as a separate entity.

All these considerations must be applied to the statements made by Daniel Whistler[43] in 1645, Thomas Fuller[24] in 1647, and Francis Glisson[25] in 1650 that rickets was a new disease which had only existed for some twenty to thirty years in England, and to that made by John Aubrey[16] when he suggested the origin of the name: 'About 1620 one Ricketts of Newberye, a Practitioner in Physick, was excellent at curing Children with swoln heads, and small legges: and the Disease being new, and without a name, He being so famous for the cure of it, they called the Disease the Ricketts."

Since the conditions now known to produce the disease—malnutrition and lack of sunlight—were not new in the seventeenth century, these statements have been questioned, and led Foote[23] to seek evidence in portraits painted before this period. He found it in many of the children in paintings of the Madonna and Child, of which one notable example is in the National Portrait Gallery in London. In that child of Harlem (No. 2595, Room 31) painted by Dierick Bouts about 1470, we see the large, flat, square head

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with Parrot's nodes, the widely open anterior fontanelle, the Harrison's groove in the ribs, and the distended abdomen of the victim of rickets. But it was particularly in the British Isles that during the following century the widespread poverty, the general disappearance of dairy produce from the diet, and the replacement of milk by bread with a consequent loss of vitamin D and calcium, produced conditions favouring the appearance of rickets on an extensive scale: the milk of nursing women on such a diet could not have supplied enough of these essential factors for their infants. It is this endemic aspect, and not the fact that Englishmen first wrote about rickets, which probably caused it to be known throughout Europe as *die Englische Krankheit.*

Confirmation that the condition was so widely present at the opening of the seventeenth century as to pass for a normal state in England is found in the statement by the royal physician, Henry Atkins, when he reported[4] in 1604 to King James I on the health of his son Charles, Duke of Albany, and wrote that the "joynts of his knees, hips and ankles being great and loose are not yet closed and knit together as it happeneth to many in their tender years which afterwards when yeares hath confirmed them prove very stronge and able persons." It is also significant of the prevailing attitude that anything in the Duke's condition which Dr. Atkins could not explain away as within normal experience, he accounted for as due to scurvy; indeed he wrote[5] to Lord Cecil that the Duke was "especially troubled with the scorbute w[hi]ch was the trew cause of his weakness and disability to gro[w]." Dr. Atkins had some reason for the statement that the condition "happeneth to many in their tender years," for Gerard Boate, physician to King Charles I, when in 1645 he compiled the book which he published in 1652, *Ireland's Natural History,* wrote of rickets as "a disease peculiar to young children, and so well known to everybody in England, as it is needless to give any description of it." All that had happened in the interval between 1604 and 1652 was that a name had come to be applied to the condition, possibly as Aubrey suggests through the fame of a Dr. Ricketts; and fame it must have been, if Aubrey is to be credited, for the name had passed into such general use by 1634 that it was used in that year by the illiterate searchers who collected the data for the Bills of Mortality for the City of London.

The almost simultaneous appearance of several books on rickets when King Charles was no longer secure on his throne, and the fact that interest was at last being directed to this disease, may be connected with the fact that for a quarter of a century, and

perhaps for twice that period, the throne had been occupied by a victim of rickets.

Of King James' rickets we have no evidence except that he was unable to walk up to the age of five but was carried in his chamberlain's arms, and that his nurse was a drunkard.[40] Of his consort, Anne of Denmark, it is also recorded that she was supported by attendants up to the age of nine,[40] but this may have been no more than a precaution against the risk of bowing of the legs so widely observed to occur in children at that time if allowed to walk too soon, and against which Petrus Forestus of Leiden (1522-97) had warned parents.[22] It may be compared to the practice of swaddling infants, which was similarly directed to the prevention of premature weight-bearing and the development of deformities; none could tell in which children rickets or osteomalacea was present, and so preventive measures were applied indiscriminately.

If there is doubt as to the presence of rickets in the King and Queen, there can be none in the case of Charles, their second son, for it is so clearly described in a newly discovered manuscript[4] that it can be diagnosed with certainty. Of the children who had preceded him, Henry, born in 1594 when Queen Anne was eighteen, was always healthy and was five feet 8 inches high at the age of seventeen; Elizabeth, born in 1596 and destined to become "the Winter Queen," was equally healthy, but Margaret, born in 1598, died in infancy; Charles, the first of the children to be born at the dark palace-monastery of Dunfermline, was so weak at birth that he was not expected to survive; he was indeed hurriedly christened on 19 November 1600, when he was a few hours old.

Within a few weeks of his birth his mother, whose affection was wholly centered in her eldest son, left him to the care of Alexander Seton, Lord Fife,[31] and he was given a modest retinue of attendant ladies. Nothing is recorded of his nurse, but she may have been Marion Hepburn, designated in the Treasurer's accounts[41] as his "rokker." Within a year he was probably weaned, and it was customary to start on diluted cow's milk or whey to which flour was added; soon after this milk was abandoned as suited only to infants, and broths and bread were substituted; in Scotland, however, the diet was then principally a cereal one lacking phosphorus in readily assimilable amounts, while the excess of carbohydrates promoted more rapid growth then calcification could cope with. There was a lack of butter and egg yolk with their content of vitamin D, while the absence of vegetables and fruit, which was so

widespread, encouraged the appearance of infantile scurvy, so often associated with rickets.

In the succeeding years Queen Anne bore other children, but none survived infancy: Duke Robert died in 1602, in May 1603 the Queen had a miscarriage, and the Princesses Mary and Sophia died in 1607 and 1606, respectively. Of her concern for the Duke of Albany there is no evidence, and from the fact that the Queen placed Elizabeth in 1603, and Mary in 1605, with foster-parents, she appears to have been indifferent to all her children except her first-born. Until 1603, Charles remained in such obscurity at Dunfermline that no record of his first three years exists; only because in that summer the royal family moved to England, leaving him in Scotland, do we learn that he was in such feeble health that it was feared to subject him to the strain of the month's journey to London.

In April 1603, three weeks after King James had left for England, Lord Fife reported[1] that the health of Duke Charles was better, that although his night's rest was still not sound, yet "the great weaknesse off his bodie, after so lang and hevie seikness, is meikill suppliet be the might and strength off his spirit and minde," which may be interpreted in the light of later reports on Charles's behaviour at this time as a courtier's way of describing an obstinate, irritable, and restless child. On 30 May 1603 he wrote again[1] and said that the duke "althoght yet weak in bodie; is beginnand to speike some wordis," but the parents made no move to bring the child south until the spring of 1604. Meanwhile Sir Robert Cary, hoping to succeed Lord Fife when Charles came to England, visited Dunfermline to find out for himself what risks he might incur. He "found him a very weake child,"[18] but decided the risk was worth taking and made his approaches to the King while Lady Cary made hers to the Queen.

On 14 April 1604 King James signed a warrant[3] to pay Dr. Henry Atkins fifty shillings a day to attend Duke Charles in Scotland and to bring him to England. Atkins was not at that date a man of any great distinction, although later he became President of the Royal College of Physicians,[34] but he had influence at court both with Robert Cecil, the future Earl of Salisbury, and with Gilbert Talbot, Earl of Shrewsbury. He was allowed £100 for the provision of drugs and was to be accompanied by an apothecary, Edward Phillips. Atkins may have had some modest skill in therapeutics and was to be responsible for the first *Pharmacopoeia Londinensis.* He may also have learned something about scurvy during a brief

naval experience in 1597 and known something about the methods which had proved so successful in the hands of Sir Richard Hawkyns[27] and Commodore Lancaster.[36] In the light of what happened on his arrival at Dunfermline it seems probable that he went there expecting to find a child with scurvy, that scurvy was incidentally present as a minor factor, and that its removal by the doctor led to his claims that he had cured the patient, whereas he had only removed some of the disabilities superimposed on the rickets which in fact continued to cripple the child for many years. Dr. Atkins arrived at Dunfermline on the night of 12 May 1604, and the following night he drafted a very long letter to his "Most Dread Soveraigne"[4]: he reported how he had been consoled by "finding His Highness walkinge with an ancient gentlewoman his nource in the great chamber . . . although he walked not alone but susteyned and lead by that gentlewoman's hand." Charles had evaded an examination by "calling for musick to one of his servants," desiring "severall kinds of measures as passes galiards etc and would imitate the instrument with the sound of the trew tune with his high tender voice": possibly the future king's love of music may be associated with the fact that he was free from his embarrassing stammer when he sang, and in passing it may be noted that one of his earliest instructors in England was to be a singing master. Atkins had succeeded in examining the child next day and had "founde him in reasonable good estate of body both with good colour bowels and . . . fulness of fleshe, eating copiously, sleeping moderately . . . his skin all over his body fayre without spott," he continued "only two or three things are to be considered: the weakness of his legges, a looseness of his body which he hath had these 20 days (as I am informed) and some drought or desyre of often drinkinge. His Highness's legges are fayre and well only his joynts of his knees . . .," and then follows the report on the joints which has already been quoted. He closed with a further comment on the child's diarrhoea: "his Highness's looseness they say is frequent with him but at this time those gentlewomen that attendeth him thinketh that he hath some great teeth breeding which are the sause of it as indeed often happeneth; we could not since my cominge make any good triall thereof because his Highness would not permitt any to feele his gums." Very wisely Dr. Atkins asked for time before coming to a decision on the wisdom of moving the patient.

It will be noted that he had observed the enlarged epiphyses at the ankles, but not at the wrists; that he makes no reference to lack of growth although this was mentioned to others; that he did

not regard the shape of the head, which all later portraits show as bearing the stigmata of rickets, as in any way unusual; that delayed dentition or carious teeth were accepted, as was the difficulty in walking. A diffuse swelling in the region of the knee suggests scurvy, which might also account for the tender gums: the abnormality in the hip joints cannot, however, be related to rickets or scurvy, unless we postulate a subluxation due to rickety flaccidity of the muscles. For the fretful temperament and the digestive disturbances to which Charles's rickets subjected him, Dr. Atkins offers no explanation of his own. His object was, however, to reassure the king, and he said as little as was consistent with his responsibilities. To Lord Cecil he was more frank, writing[5] of how "at my cominge the duke was far out of order." Dr. Atkins was neither more venal nor more ignorant than his contemporaries, but he exceeded other physicians in diplomacy and he realised the importance of enhancing his reputation with the king's principal minister. He thus stressed the difficulties which he had overcome: "I thank god w[ith] easy remedyes he is soe well recovered that now not onely his stomack & mouthe & other partes are apparently well w[hi]ch before were never 20 days well together as they here all reported, but his strength groweth & he is able to goe alone five or six times togither the whole lengthe of a very large cha[m]bre the longest in dumfermelinge, having never gone alone before my cominge in his life." Dr. Atkins did not conceal from Lord Cecil that he was providing him with a "treu foundation whereon to build my credit w[i]th his ma[jes]ty." The letter closed on a crescendo of sycophantic notes.

The journey south was planned to take three months, in order to reduce the strain on the royal patient, and arrangements had to be made for accommodation at great houses on the route. Among other requirements were special furnishings, which included twelve beds under one roof, and additional linen, pewter, and kitchen equipment. The duke's litter was accompanied not only by Lord and Lady Fife and the physician, but by a troop of horse and trumpeters. A caterer was sent ahead for provisions and supplies of beer.[37]

The cavalcade set out on 17 July 1604, and was met by Sir Robert Cary at Bishop Auckland in Durham. On 29 July Atkins wrote to his other influential patron, Gilbert Talbot, Earl of Shrewsbury, telling him how God had blessed his counsel in bestowing better health on Duke Charles ever since the doctor had taken charge of the case. On 6 August Lord Shrewsbury wrote[38]

the gratifying and expected reply that, happening to be in the Queen's withdrawing room at Whitehall on the previous day, he had taken the opportunity to read to Her Majesty such parts of the letter as related to her son's health: the Queen had "uttered many good words" about the worthy doctor.

From Bishop Auckland the party moved to Mr. Wentworth's house near York, whose owner, as Earl of Strafford, was to serve Charles again and to his own destruction. From Wentworth Woodhouse, Dr. Atkins wrote[6] to his "Most Dread Souvereigne" on 4 August to report that his son was "in good health" and had "rested all the firste day, beinge the sabathe." From the 9th to the 15th of August, the rest had been taken at Lord Shrewsbury's great house at Worksop in Nottinghamshire, where although the owner was absent, care had been taken to provide for Lord Fife's arrival with his charge by supplying some "honorable friend to accompany his Lordship at Worksop," provide a welcome, and good sport in the park.[39] Lord Shrewsbury was detained in town in expectation of the arrival of the Constable of Castille in connection with a proposed marriage between Prince Henry and the Infanta Anna, heiress of Spain.

We next hear[44] of Charles at Peter Willoughby's house at Wolleton in Nottinghamshire, where again the host and household were absent, an absence which reveals the hazards of the journey for they had moved to another family house in Warwickshire "in regarde of the sickness in these parts," which suggests an outbreak of plague in Nottinghamshire. But the greatest difficulties of the journey are revealed in an account[37] of the three days passed in a mansion belonging to Sir William Skipworth at Leicester and borrowed by the mayor for their reception. It had to have its furniture and other necessaries supplemented from the Guildhall, and to the mayor's embarrassment, much of the borrowed plate and linen disappeared with the party on 17 August.

Finally they reached "Eaton," in Northhamptonshire, presumably Easton Neston, near Towcaster, the seat of Sir George Fermor, and here Charles was met by his parents. According to Cary[18] they were "very glad to see their young son," and together they now moved on to Windsor which was reached in the first week in October. On 27 October, Charles was given apartments in Whitehall, and a new phase of his life opened.

Of Dr. Atkins' connection with his case we hear no more, but the physician had his reward in the prestige and perquisites which his association with the royal family were to bring him: on 24 Sep-

tember 1604, while still on his journey south, he had received the office of one of the King's physicians in ordinary.[7] In May 1605, he was granted lands in Surrey.[8] Later he received £700 from the crown in connection with some tithes,[12] was allowed to buy certain lands belonging to the Queen's manor of Ampthill,[14] and was granted such other marks of the royal favour as presents of deer.[15] Most important of all, however, was the mounting list of courtiers who consulted him. His prestige withstood his failure to prevent the death of Prince Henry[13,33] in 1612 and of the Queen at the early age of forty-six in 1619, but it is significant that at first the Prince had refused to see him.[35] He was also unsuccessful in his treatment of Robert Cecil,[10] now Earl of Salisbury, during his last illness in 1611/12. In each of these cases he had, however, had as a colleague Sir Theodore de Mayerne, who was held in universal respect: indeed in Lord Salisbury's case Sir Theodore had said it was hopeless a year before the fatal outcome. Perhaps this support was an important factor, for when in 1612 Sir Thomas Bodley was failing, Dr. Atkins was blamed for mistreating the case, which he had identified as "dropsy and scurvy."[11] It is notable that he received no mark of favour from Charles himself, although he lived on for twelve years of the new reign. It was Sir Theodore who was henceforward to enjoy the royal confidence in an age which was leaving Dr. Atkins far behind and no longer esteemed the secret nostrums of Sir Walter Raleigh which Dr. Atkins was supposed to possess.[40] A remarkable light is indeed thrown on his old-fashioned methods in a manuscript[9] of twenty-four pages written by him on the health of Lord Salisbury in 1611/12, in which we can see all the applications of humoral pathology in the examination, the remedies, and the course of treatment prescribed. Thus Lord Salisbury's spleen was full of melancholy and he must have "a warm bath of sweet water with remollient and cooling herbs for six days, every morning staying in so long as you feel no fayntness and do not sweat," after which he was to go to bed and to be gently rubbed and anointed "to comfort the brain," which was "most moist and cold." This cerebral dampness was to be assisted by "a powder with which you may dress your hair every night, and in the morning, comb it off, by which means your brain being dried, rheumatic distillations shall be promoted by consuming their matter." Perhaps the most convincing recipe was for a perfume "to correct and make more wholesome the air in your chamber," for the windows of Salisbury House were rarely open.

During these eight years which had passed since Dr. Atkins had written of his successful treatment of Charles, he must frequently have been reminded of his failure by the continued disabilities of his sometime patient. Although the statement occurs in the Salisbury Papers (xvi, 163) that on the 8th of July 1604, Charles was "able to walk alone without the aid of a staff," yet the contemporary writer, Osborne,[35] observed his "extreame weaknesse which disabled him (as the like did his father) until the 7th year of his age, to goe, or scarce to stand alone; crawling, when of himself he would be in motion, upon all four, in a most unseemly manner. For the recovery whereof he was beholding to the skill of one master Stutaville, an excellent artist for strengthening limbs and straitning crooked bodies." In fact, Sir Robert and Lady Cary had taken matters into their own hands and employed Edward Stutfeyld, a practitioner in bonesetting, who had been licenced by the Company of Barber-Surgeons of London on 20 April 1602.[43]

Charles owed much to the Carys, who not only accepted the risk of his custody but protected him from harmful interference. Many had wanted to have charge of him "but when they did see how weake a child he was, and not likely to live, their hearts were downe, and none of them was desireous to take charge of him,"[18] but under the Carys he "grew better and better."[18] They had at times to overcome the King's impatience at the slowness of his son's progress and Lady Cary "had many a battaile" with the King, who desired among other things that "the string under his tongue should be cutt, for he was so long beginning to speak." Charles never wholly overcame his stammer, in spite of Lady Cary, but in later life he could speak clearly whenever he was deeply moved, a factor which made possible his magnificent defence at his trial. He shared this disability with his brother, Henry, and passed it to his son, Charles II. It was also a failing of Charles's future brother-in-law, Louis XIII.

On another matter perhaps Sir Robert Cary overstates his wife's influence with the King; he writes[18] that the king wanted Charles "putt in iron bootes, to strengthen his sinews and joints," but that Lady Cary protested successfully against the measure. We have, however, the actual boots* of Spanish leather, fortified with a brass heel, to show that the King's wish was followed if in modified form.

* The boots are not only strengthened with brass round the heel, but have a brass support round the back, reaching up to the ankle joint and sloping forwards and downwards at the sides, which was designed to prevent the foot turning over. They are numbered A 18293 at the London Museum, Kensington Palace.

There were many occasions when the King must have felt impatient, especially when his son's weakness was revealed on public occasions. On 6 January 1605, when he was created Duke of York, all his robes and other vestments had had to be carried by attendant gentlemen, and Charles himself had been held in the arms of the venerable Lord High Admiral, the Earl of Nottingham.[28] On 15 September 1608, he was too weak to accompany the royal family to the christening of the second son of Lord Arundel,[40] and a contemporary wrote that he "was exceedingly feeble in his lower parts, his legs growing not erect, but repandous [wavy] and embowed, whereby he was unapt for exercises of activity."[2] As late as 1610 his movements must have been very clumsy, for in that year we learn[40] that his part in a masque at Whitehall, arranged by Ben Jonson, had to be specially contrived to conceal his legs. In the various figures in which he danced, a circle of children continuously surrounded him. By then it may not have been clumsiness so much as deformity which had to be hidden, for although such defect is scrupulously excluded from all portraits, it alone accounts for the story[19,40] of how when the Prince of Wales, the Duke of York, and George Abbot, Archbishop of Canterbury, were waiting for an audience of the King, the Prince said he would one day make his young brother archbishop "that he might have a gown to hide his legs." Henry is reported to have placed the Archbishop's square cap on the child's head, whereupon Charles indignantly tore it off and trampled on it.

Charles had escaped from the solitude and neglect of Dunfermline only to suffer from continuous teasing by his dominating elder brother; what Sir Charles Cornwallis,[20] writing in 1626, dismisses as "a kind of rough play and dalliance," may account for the Duke of York's wayward and morose temper at this time,[30] while the comparison he could now make between his mother's feelings for Henry and himself contributed to his habitually gloomy and sullen reserve. These years during which his body became malformed also saw the development in him of that malformation of personality, an affectionless character.

It was perhaps fortunate that in 1611 he was given a completely separate household, and as a contemporary writer[2] records of this time, "those tender limbs began so to consolidate and knit together, as the most eminently famed for exercises of honour were forced to yield him up the garland." But the long bones became completely calcified before growth would normally have ceased, and he never

exceeded five foot four inches in height.* Sir Henry Halford made no observations of any scientific interest when he was present at the opening of King Charles's coffin in 1813 and became possessed of the amputated vertebra,[26] but exact measurements are available through the preservation of his cuirassiere suit of armour at the Tower of London. His lack of height was something of which the future king was always to be conscious, if we may judge by the manner in which his favourite artist, Van Dyck, conspired to conceal it by such devices as a raised throne, a flight of steps, the presence of a dwarf in the lower part of the composition, mounting the King on a horse, and similar means, which were to be revived for Queen Victoria. In the case of the mounted figure of Charles made by Hubert le Sueur, which now stands at the entrance to Whitehall, we have the specific instructions[29] that he was to cast a "Horsse in Brasse bigger than a greate Horsse by a foot, and the figure of his Maj. King Charles proportionable full six foot"; in fact, the figure of the King was to be enlarged out of all proportion to that of the horse. The artists' efforts have been so successful that today few realise Charles's lack of inches; only an informed study of the shape of the head in the portraits reveals the marks of rickets.

The extent to which he overcame his disabilities is a tribute to Master Edward Stutfeyld, who certainly obtained no assistance from those who regulated Charles's diet when he set up his own household at the age of eleven. In 1806 there was published[42] from the original manuscript under the sign manual of King James a remarkable document which has escaped the notice of even such careful historians of dietetics as the late Sir Jack Drummond. In it is to be found exact details of the "diet and particular fare" for every member of the household down to the wood-bearers and sweepers: the dishes "for the Duke of York his Grace at Breakfaste," at dinner and supper, on flesh days and fish days, are all prescribed, even what was permitted "for the Duke of Yorke's Drink-

* The cuirassiere suit of armour preserved at The Armouries, H.M. Tower of London, is No. 11-19, and is recorded in the Tower inventory of 1660 as belonging to King Charles I. The measurements are: Height, 5 ft. 4 in.; width of shoulders, 1 ft. 6 in.; waist, outside cuirass, 34½ in.; length of arm from point of shoulder to wrist, 21 in.; length of leg from fork to ground, 31 in.; length of leg from knee to ground, 18 in.

The measurements of a doublet reported to have belonged to King Charles I and on loan to the Victoria and Albert Museum by the Earl of Ancaster are: upright collar, 3 in.; neck to waist, 14½ in.; length of arm from point of shoulder to wrist, 22 in.; these measurements are, however, subject to much error, since the waistline can only be estimated and the sleeves are full, loose, and slashed in the upper arm. It must also be remembered that fashion had recently shifted the waistline from the very low Tudor one to an exaggeratedly high one. Although much clothing reputed to have belonged to King Charles has survived, it appears with this exception to consist of undergarments and in particular of shirts worn on the scaffold, which do not admit of accurate estimates of the wearer's measurements.

inge betweene Meales," and from it we know that his diet, while generous, was deficient in dairy produce and completely lacking in vegetables.

When we consider the whole record of Charles's first twelve years, we can understand why Sir Simond D'Ewes wrote[21] in 1612, when the Prince of Wales died, "Charles, Duke of York . . . was so young and sickly as the thought of their enjoying him did nothing at all [to] alienate or mollify the people's mourning." And those twelve years are still reflected for us in the passive melancholy face, the cold grey eyes, never varying in expression however often they were painted, and the shadows which lurk behind the mask of the great Van Dyck portraits, the shadows of an unloved and unwanted child.[17]

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The Influence of Michelangelo on Some Anatomical Illustrations

LOLA L. SZLADITS*

Hamlet: *His beard was grizzled—no?*
Horatio: *It was, as I have seen it in his life,*
A sable silvered.
Hamlet: Act I., Scene II.

IN the *Historia de la composición del cuerpo humano* of Juan Valverde de Hamusco,[1] published in Rome in 1556, a strangely reminiscent figure meets the eye in Table I of Book II (Fig. 1). It is the skinned muscle-man, holding a dagger in his left hand and his long, pathetic-looking skin in the other. Harvey Cushing[2] describes it as having been "evidently taken from Michelangelo's Last Judgement in the Sistine Chapel," a fact not mentioned by other sources.[3] However, this attribution seems to be well founded, especially if one becomes acquainted with the background of the Spanish artist who was entrusted with the illustration of this anatomical work. It seems to be natural to represent a muscle-man holding his skin, as though it were a shirt,[4] nevertheless a greater genius than that of the Spanish artist, Gasparo Becerra, is at the

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1 Juan Valverde is one of the most important Spanish anatomists, who in Spain destroyed Galenical anatomy and imported the innovating ideas of Vesalius. His date of birth is unknown. His first extensive work, *De animi et corporis sanitate tuenda*, is dated 1552. He came to Rome probably only later, as physician to Cardinal John of Toledo, whom he accompanied to Italy. *Cf.* Hirsch, A. *Biographisches Lexikon der hervorragenden Ärzte aller Zeiten und Völker*. 2.ed. Berlin, Urban u. Schwarzenberg, 1931, vol. 1, p. 122. *Cf.* also Jöcher, C. G. *Allgemeines Gelehrtenlexikon*. Leipzig, Johann Friedrich Gleditsch, 1750, vol. 4, col. 1437.

2 Cushing, H. *A bio-bibliography of Andreas Versalius*. New York, Schuman's, 1943, p. 146. *Cf.* Cushing, H. Ercole Lelli and his écorché. *Proc. Charaka Club*, 1938, *9*, 3-20. In this article Cushing dwells on the connection between the "Last Judgment" and Becerra. "As the first edition of this book was published in 1556 at Rome, it may well be that Becerra was at work there, and that his inspiration was drawn from his master's recently finished fresco over the altar of the Sistine Chapel."

3 Choulant, L. and Frank, M. *History and bibliography of anatomic illustration*. Chicago, University of Chicago Press, 1920, pp. 205-208. Includes a list of plates that are not Vesalian, but does not note the connection of this one with Michelangelo. *Cf.* Meyer, A. W. and Sheldon, K. W. The Amuscan illustrations. *Bull. hist. med.* 1943, *14*, 667-685. In this article the authors state that "Valverde does not claim originality for the famous muscle-man." An engraving by the monogrammist M. F., dated 1536, and reproduced in this article, shows Apollo flaying Marsyas. The muscle-man appears in the same posture as that of Apollo.

4 Berengario da Carpi's *Commentaria cũ amplissimis additionibus super anatomia Mũdini. . . .* (Bononiae, apud Hieronymum de Benedictis, 1521) contains several woodcuts of anatomical figures which lift up part of their skin to show the muscles of the abdomen.

Fig. 1. Gasparo Becerra's muscle-man in Valverde's *Historia de la composición del cuerpo humano* (Rome, 1556).

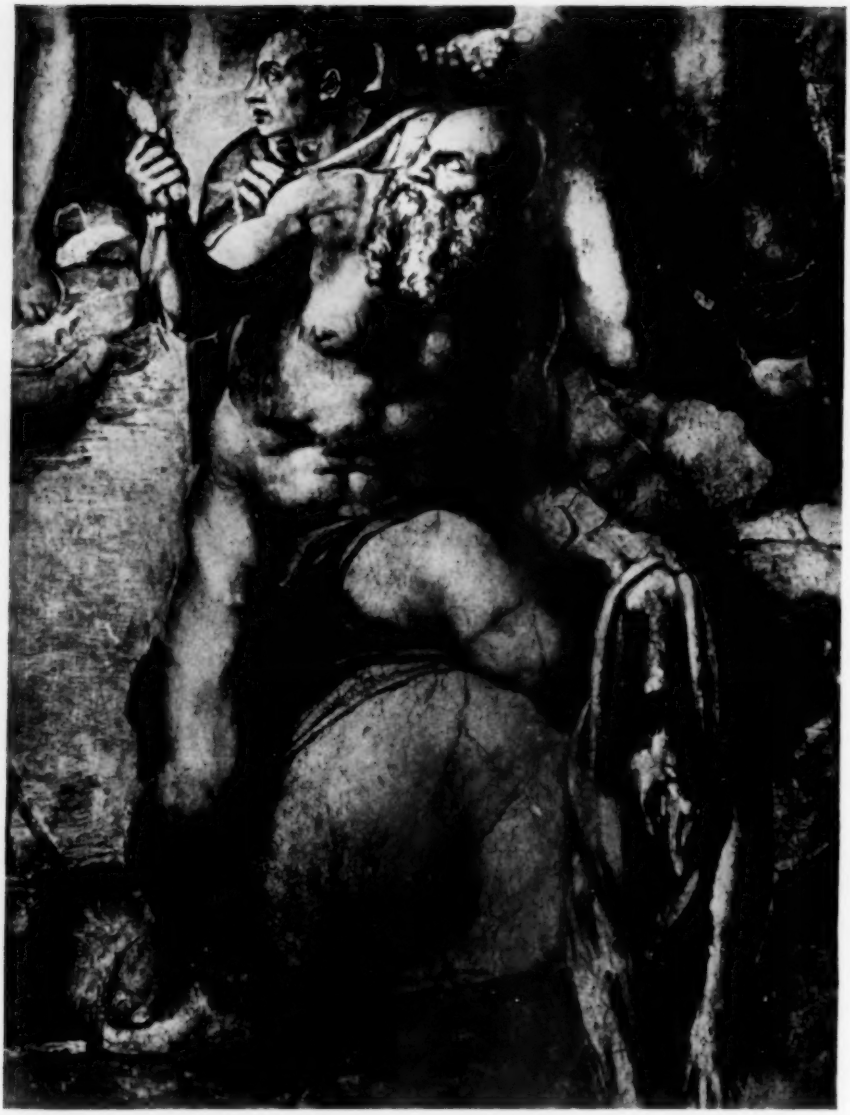

Fig. 2. St. Bartholomew. Detail from Michelangelo's "Last Judgement" in the Sistine Chapel, Rome.

GREGOR. HORSTI, D.
De
NATVRA HVMANA
Libri duo,
Quorum prior de corporis structura, posterior de anima tractat,
Vltimò elaborati, Commentariis aucti, figurisq; nouis Anatomicis ære incisis exornati.
Cum præfatione de Anatomia vitali & mortui pro conciliatione Spagyricorum & Galenicorum plurimum inseruiente.
FRANCOF. AD MOENVM.
Typis ERASMI KEMPFERI,
Sumptibus CLEM. BERGERI, Bibliopolæ Wittebergensis.
ANNO M. DC. XII.

Fig. 3. Title-page of Gregor Horst's *De natvra hvmana* (Wittenberg, 1612).

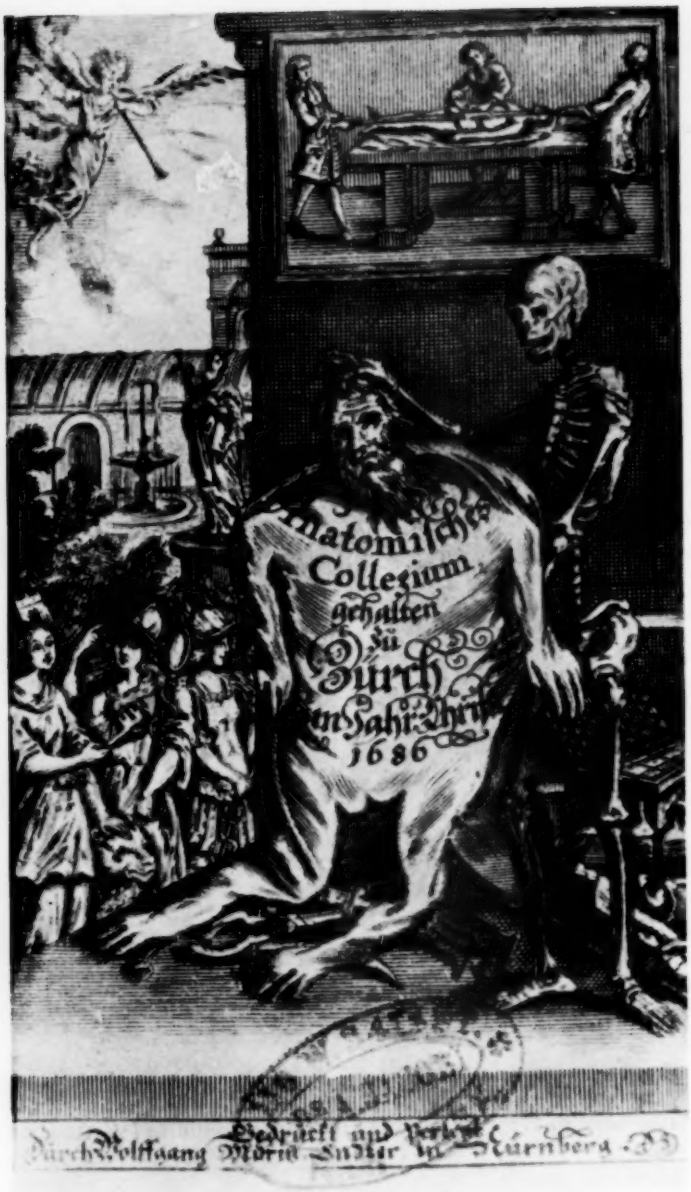

Fig. 4. Title-page of Johannes von Muralt's *Anatomisches Collegium* (Nürnberg, 1687).

Fig. 5. Title-page of Thomas Bartholinus' *Anatomia reformata* (Leyden, 1651).

Fig. 6. Mateo Antonio Irala's muscle-man in Martinez' *Anatomia completa del hombre* (Madrid, 1728).

source of this presentation, and centuries of legend precede this seemingly formal anatomical figure.

Gasparo Becerra, by now almost forgotten, was well known in his day and even in the nineteenth century is mentioned as "an artist of great celebrity."[5] He was born in 1520 at Baeza in Andalusia and excelled early as painter, sculptor, and architect. He visited Rome at a time when Michelangelo was at the zenith of his fame and it is said that he studied under him and worked with him on St. Peter's.[6] He was also much influenced by Raphael, Daniele da Volterra, and Vasari, whom he assisted in the decoration of the Palazzo della Cancelleria. He returned to Spain in 1556, the year that Valverde's work was published, and under the protection of Philip II executed some frescos in public edifices and in the Palace of Madrid which perished in the fire of 1734. He was appointed painter to the Court in 1563. "He was one of the first reformers of the Spanish School, by introducing a superior style founded on that of Buonarotti."[7] He died in Madrid in 1570. All sources agree that Becerra was deeply interested in the study of anatomy and also that he produced two anatomical statues,[8] "models of which are in the hands of all professors."[9] The sources all mention him as the artist who designed the anatomical plates in Valverde's work.

Knowing the background of the artist, it is hardly surprising that for his work he copied the figures of Vesalius, adding some of his own invention. One of them is the muscle-man, but his originality there did not go any further than to adapt one of Michelangelo's figures for his own use.

On Christmas Day 1541 "to the marvel of all Rome and the whole world."[10] the Last Judgement in the Sistine Chapel was unveiled. Vasari, who was in Venice at the time, writes that "when (he) went to Rome to see it (he) was thunderstruck."[11] Vasari was not the only one. For many years, before and after, it remained the center of controversy. It aroused violent criticism and was the subject of correspondence between Michelangelo and Aretino, the Popes, and those surrounding them. The Master of Ceremonies of

5 Bryan, M. *Dictionary of painters and engravers.* New ed. London, George Bell, 1886, vol. 1, p. 99.

6 O'Neil, A. *Dictionary of Spanish painters.* London, C. O'Neil, 1833, vol. 1, pp. 26-29.

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8 Choulant-Frank, *op. cit.*, p. 205. Thieme, U. and Becker, F. *Allgemeines Lexikon der bildenden Künstler.* Leipzig, Engelmann, 1907-1950, vol. 3, p. 132. Streeter, E. C. An unpublished bronze écorché. *Ann. med. Hist.*, 1917, *1*, 74.

9 O'Neil, *op. cit.*, vol. 1, p. 27.

10 Vasari, G. *The lives of the painters, sculptors and architects.* London, Everyman's Library, J. M. Dent, 1950, vol. 4, p. 144.

11 Vasari, *ibid.*

Paul III (1534-1549), Biagio da Cesena, "said it was a disgrace to have put so many nudes in such a place and that the work was better suited to a bathingplace or an inn than a chapel."[12] In revenge the angered Michelangelo "as soon as they had gone, drew M.Biagio from memory, as Minos in Hell among a troop of devils, with a great serpent wound about his legs."[13] It has also been suggested, but rejected,[14] that St. Bartholomew, the figure that is of primary importance to us, is none other than Michelangelo's other critic, the poet Aretino.[15] The controversy did not cease after the unveiling of the Last Judgement and many years later Pope Paul IV (1555-1559) proposed to Michelangelo "to alter his Last Judgement in the chapel because of the nudes there. Michelangelo replied, 'Tell the Pope this is a small matter, but let him reform the world, pictures are quickly mended.' "[16] Consequently Daniele da Volterra was commissioned "to provide draperies for the most obnoxious figures and won thereby the name of *Il Braghettone* or the breeches-maker."[17]

These facts are well known, but it may be useful to keep them in mind when we consider the position of a Spanish artist visiting Rome at this time; an artist who worked with Michelangelo and Vasari and who knew Daniele da Volterra. It can hardly be a coincidence that the anatomical figure in question is reminiscent of St. Bartholomew in the Last Judgement.[18]

This figure (Fig. 2) is one among the saints, apostles, and prophets who form a circle around Christ, described by Vasari as "a fine St. Bartholomew showing his flayed skin."[19] Condivi wrote: "They all show the Terrible Judge the object which deprived them of their lives for having remained true to His name: St. Andrew holds the cross, St. Bartholomew his skin. . . ."[20] It has been pointed out that the tortured face of the skin is that of Michelangelo himself[21] and there is no doubt much resemblance between it and

12 Vasari, *op. cit.*, p. 142.

13 Vasari, *ibid.*

14 Redig de Campos, D. *Il giudizio universale di Michelangelo.* Roma, Bretschneider, 1944, vol. 1, p. 29.

15 For a correspondence between Michelangelo and Aretino *cf.* Symonds, J. A. *The life of Michelangelo Buonarotti. . . .* London, J. C. Nimmo, 1899, vol. 2, pp. 45-56.

16 Vasari, *op. cit.*, p. 157.

17 Symonds, *op. cit.*, vol. 2, p. 57.

18 "Caen Bermudez had seen a pencil sketch by him (Becerra) of part of the Last Judgement." Stirling-Maxwell, W. *Annals of the artists of Spain.* New ed. London, J. C. Nimmo, 1891, vol. 1, p. 289.

19 Vasari, *op. cit.*, p. 142.

20 Condivi, A. *Vie de Michelange Buonarotti.* Paris, Librarie Floury, 1949, p. 52.

21 Lacava, F. *Il volto di Michelangelo scoperto nel Guidizio Finale.* Bologna, Zanichelli, 1925.

known portraits of Michelangelo.[22] In his right hand St. Bartholomew holds up the knife with which his martyrdom was committed, an attribute of the Saint in traditional iconography.

Of the Apostle himself little is known.[23] He has been identified as Nathaniel,[24] who after the Ascension went to Armenia, where he suffered martyrdom, having been flayed and crucified. "The legends describe him as having a quantity of strong black hair and a bushy grizzled beard."[25] He is the patron saint of butchers and tanners. He is not often represented in art, and it seems that, except for some traditional representations of his martyrdom, the one by Michelangelo of the Saint holding his own skin did not have any precursors.[26]

About fifty years after Valverde's work was published, in 1607, there appeared in Germany a little book called *De natvra hvmana*, whose author, Gregor Horst, was a widely travelled and well-known practitioner in his day, known to his contemporaries as the "German Aesculapius."[27] The title-page of this book (Fig. 3),[28] unsigned and undated, is of poor quality in design and workmanship. In almost every detail it reflects the basest style of the seventeenth century. The chariot of the sun on the upper part, drawn by fierce-looking horses, is firmly connected with the earth by the flower-pots which lead the eye to the niches below. In one of those niches, holding his skin up high, next to a spiral column on which the charming post-Renaissance grapes seem to be mourning their existence, stands our muscle-man. He is almost in the same position

22 For a classic description of Michelangelo's face *cf.* Vasari, *op. cit.*, p. 179: "His body was in proportion to his face and somewhat large; his nose flat, having been broken . . . ; his eyes were rather small, of horn-colour, with bluish-yellow spots. His lids had few hairs, his lips were thin, the lower thicker and projecting a little more than the upper. His chin was well-proportioned; his beard and hair were black sprinkled with many white hairs, his beard not being very long or thick and bifurcated."

23 Menzies, L. *The saints in Italy*. London, Medici Society, 1924, p. 51.

24 *John, I*, 45-51.

25 Jameson, A. B. *Sacred and legendary art*. Boston, Houghton Mifflin, 1896, vol. 1, p. 238.

26 I am indebted to Professor William S. Heckscher of the Department of Art, State University of Iowa, who drew my attention to the fact that the human skin had a moral meaning in the Middle Ages. At the Last Judgement, Everyman sheds his skin and with it his evil humors. Professor Heckscher writes: "Pierre Bersuire (Petrus Berchorius), a Benedictine, Abbot of St. Eloi, Paris, friend of and host to Francesco Petrarca, on the latter's visit to Paris, writing circa 1340 A.D. (*Dictionarium*, Basel, 1583) [says]: 'Pellis refers to the human skin as "memoriae peccatorum." ' This shows the meaning given, I presume, by Michelangelo to the *pellis* shed by St. Bartholomew, missionary to India, who drops his skin, which assumes in Michelangelo's Last Judgement the features of Michelangelo, down to Hell."

27 Hirsch, *op. cit.*, vol. 3, p. 304. Gregor Horst was born in 1578 in Germany. After his studies in Wittenberg and Helmstädt, he travelled to Basle, where he studied medicine and received his doctorate in 1606. In the same year he was made Professor of Medicine in Wittenberg and in 1608 at the University of Giessen. He died in 1636. *Cf.* also Jöcher, *op. cit.*, vol. 2, col. 1716.

28 Title-page is that of 1612 edition.

as in the original work, except that he now holds the knife in his right hand, which previously held the skin, and in his left he holds the skin.[29] Having lost his natural environment, with his left foot no longer poised on a stone, the figure does not retain the grace of the original. In order to fit into the niche the right arm had to be brought closer to the body and, although imitating Becerra, this artist succeeded in producing a caricature of his work. The muscle of the temples looks like a bullet hole and the muscle of the jaw has slipped too far down. Those of the upper-arm have grown to such an extent that they resemble the ruff of a dress rather than muscles. Those of the legs wind around him like ribbons, ending in what seem to be socks instead of the bones of the foot. His poor skin hangs like a scarf with its drab fringes dragging along the knee.

The other niche, behind the same spiral column, contains a skeleton leaning on a staff,[30] and the whole title-page is "charmingly" finished by a smiling angel's head over a sunny, flowery scene where the spider weaves his web, bees hum and collect honey from the same kind of flowers as shown above.

Very little comment seems to be necessary in this case. An artist who undoubtedly was more interested in the decorative arts than anatomy is probably responsible for it, also, no doubt, an artist of very dubious talent. Even aside from the primary figure, the title-page as a whole leaves the same impression. It could easily be a schematic sketch, which with other figures could be used for different books as the need arose.

Also from Germany comes another title-page, again unsigned, again decorating the work of a physician, who in his day was highly esteemed (Fig. 4). The engraved title-page of Johannes von

[29] The 1682 edition of Valverde's work, published in Venice, also has the original figure reversed.

[30] This figure, a reversed copy of Valverde's Table I of Book I comes originally from Vesalius, *De corporis humani fabrica*, Lib. I, fig. 1, where the skeleton is leaning on a spade. It reoccurs in Table II of Horst's work, without the Vesalian background, spade or tilted head, all of which had already disappeared in Becerra's engraving. The head here is turned *en face* like that of Becerra's skeleton but bears an empty grin. The one on the title-page repeats this, and here the left arm was moved closer to the body to fit into the niche. The skeleton leaning on the spade returns frequently in books of anatomy. To list only a few: Paré, Ambroise. *Les oeuvres* . . . (Paris, Gabriel Buon, 1575, Book 4, Chap. 40, p. 189 and English editions); Paaw, Petrus. *Primitiae anatomicae de humani corporis ossibvs* (Lugd. Bat., Ex officina Ivsti à Colster, 1615, opp. p. 24); Paaw, Petrus. *Svccentvriatvs anatomicvs* (Lugd. Bat., apud Iodocum à Colster, 1616, opp. p. 1); Verduc, Jean Baptiste. *Nouvelle ostéologie* . . . (Paris, Laurent d'Houry, 1689, opp. p. 1. Signed: "Levesque sculpt." Inscription: "Cette figure du squelette de l'homme a este tiré sur celle du Titien le plus fameux peintre de son temps."); Tauvry, Daniel. *A new rational anatomy*. (English from the third edition, London, Midwinter & Leigh, 1701, pl. 20, opp. p. 299); Tauvry, Daniel. *Nouvelle anatomie raisonnée* . . . (4 éd., Paris, L. d'Houry, 172, pl. 20); Thomson, George. *The anatomy of the human bones* (London, R. Ware, 1734, pl. XII, following p. 132).

Muralt's[31] *Anatomisches Collegium,* published in 1687 in Nürnberg,[32] is far more interesting from a stylistic point of view than the previous one. The basic idea of the representation of the figure seems to flourish at this stage, but at the same time it has been deprived of its original meaning. The skin, which formerly only played a secondary rôle and was used as a decorative element, now occupies an eminent position. It is no longer a shirt for covering up the muscles. It is an overcoat, and a rather heavy one. Although the frail skeleton, no longer in possession of his muscles, seems to be grinning at the whole procedure, he must use both arms to support his skin, which he grips most indelicately by the hair. Judging by the face of the skin, which previously retained a certain objective calm, it does not like the situation at all, and its left hand is half raised as though to push the skeleton away. The inscription which was added to this now prominent figure, makes this gesture seem by no means surprising. The arms and the legs have a leather-like quality, and we recall that St. Bartholomew was the patron saint of butchers and tanners. An open instrument case stands on the floor, with dissecting instruments strewn around. Evidently it was not long ago that the skeleton was still enveloped in his skin, at which he grins now in such a patronizing way. The picture above his head reminds us of the same; it represents a schematic dissection scene with three figures and a corpse, following certain traditional rules in its representation. All this takes place in the entrance of a building, perhaps an anatomical theatre, the courtyard of which is visible at the left. It is a charming courtyard with a fountain and a statue of Aesculapius holding his staff. Hermes, Athena and Rhea have come to witness the main scene and look at it with blank faces. At the upper left corner a heavenly messenger with his trumpet also arrives just in time. Is he waking the dead?

A glance at the title-page is enough to indicate the "versatile" mind that was at work here. If any doubt arose about the former, there can be none that this title-page was especially designed for this anatomical book, or should one say deliberately? The artist made use of almost anything he could think of in connection with an anatomical work. From antiquity to the present nothing was

31 Johannes von Muralt was born in 1645 in Zürich. His family was Italian and had to take refuge in Switzerland for religious reasons. After studies in Zürich, he studied medicine in Basle, Leyden, London, Oxford, Paris, and Montpellier and received his doctorate in Basle. He settled in Zürich, where he practised medicine and lectured on anatomy. He is to be considered the founder of anatomical studies in Zürich, where in 1686 he founded an anatomical college. He remained its chief until 1724 and died in 1733. *Cf.* Hirsch, *op. cit.,* vol. 4, p. 302. *Cf.* also Jöcher, *op. cit.,* vol. 3, col. 759.

32 The engraved title-page bears the date 1686.

omitted. Greek gods, angels, the medical schools, anatomical dissections—all are there. He may have even read von Muralt's description of the skin: "The skin is a membraneous cover of the human body, in order to protect the parts beneath it from all accidents and to act as an organ of perception. It can easily be removed from the arms, legs and abdomen, but with difficulty from the palmar surfaces and soles of the feet, the forehead and face, because there it is attached to the fleshy 'leather skin' with its fibres and filaments."[33]

In following the development of the presentation of the muscleman and his flayed skin, it is here that according to unwritten rules in stylistic development, we have reached the flowering and at the same time the beginning of decay. In the first stage, where the skin was used as a decorative device and as a practical idea, to show the muscles it covered, both the use of this device and the purpose were justified. Here, by carrying the title of the book, the skin fulfills all possible uses to which it can be put. This debases it and makes it look ridiculous. Gone is St. Bartholomew, gone the fine exposition of the muscles, but we have retained the stupid grin of the skeleton and the tortured, ashamed look of the skin.

This did not necessarily have to happen. The title-page of the 1651 edition of Thomas Bartholinus' *Anatomia reformata*[34] (Fig. 5) is one of fine workmanship and good design. A flayed skin spread over the title-page carries the inscription and, although the hanging head, arms, and legs are so realistic that the inclusion of the inscription may be regretted, the decorative elements are so strong and the workmanship of such high quality that the lettering across the skin is not disturbing. Besides, since there is no overcrowding of unnecessary figures or detail, the solitary skin spread out in front of the niche lends it a certain sad grace. It may be assumed that the unknown German artist of 1686 knew the Bartholinus work, which was printed in Leyden.[35]

Having seen the flowering, after 1728 one can witness the de-

33 "Die Haut ist ein *membranosischer* Uberzug desz menschlichen Leibs darzu verordnet dasz sie die unter ihr ligende Theil vor allerhand Unfall beschirmen möchte und einen Werckzeug der Empfindlichkeit abgebe. Sie lässet sich leichtlich von Armen Beinen und Schmeerbauch abziehen schwerlich aber von den Fuszsolen und Handballen von der Stirn und Angesicht weil sie daselbst mit der fleischichten Pergaments-Haut und ihren Fasen oder Zäserlein vereiniget ist." (von Muralt, J. *Anatomisches Collegium in welchem Alle und jede Theile desz Menschlichen Leibes . . . beschrieben worden . . . vorgetragen zu Zuerch/ Auf Einer Loeblichen Gesellschafft zum Schwartzen Garten . . .* , Nuernberg/ . . . Wolfgang Moritz Endter, 1687, p. 15.

34 *Cf.* Hirsch, *op. cit.*, vol. 1, p. 356. *Cf.* also Jöcher, *op. cit.*, vol. 1, col. 820.

35 Another edition has imprint: Hagae-Comitis, Ex Typographia Adriani Vlacq, 1655, printed in place of that of the first edition.

cay. It was then that Martino Martinez,[36] a Spanish physician, first published his *Anatomia completa del hombre,* illustrated by Mateo Antonio Irala, a monk of the Order of St. Francis.[37] He was born in Madrid in 1680 and was best known as a painter and engraver. "Artists admired the purity of his design and the multiplied testimony of his industry; indeed, he was an object of general esteem."[38] He died in Madrid in 1753. Plate 19 of the *Anatomia completa* reverts somewhat to the original idea. A muscle-man exposes his back (Fig. 6), holding up his skin in his left hand. Without knowing the original, it would be hardly noticeable or even identifiable. It is now purely a decorative device and serves as a well-known artistic touch, that of "closing off the picture." It extends all across the left border of the plate, supplying a dark contrast to the geometrical frame on the right, on which the muscle-man is leaning. It even covers part of the bottom of the composition, enveloping part of Figure 2. If one compared it to a velvet spread, so often used as a background to statues or portraits, one would not be far from wrong. Today it would be analysed as being an abstraction of the original skin. The straight lines of its exaggerated length, the sketchy presentation of beard and hands, all done with a decorative flourish not seen up to now, prove that it is far removed from the original. The fact that the face is turned in profile is best proof for that. What has been retained from the original, but used at a different angle, is the way the muscle-man grasps the skin at the nape of the neck. Apart from that everything else has been omitted, including the more or less human look of the skin itself. Here it has been reduced to an abstract shape, it has become part of a stage setting and, as far as composition is concerned, it fulfills that rôle quite well.

And so the circle closes where it originated: in Spain. After two centuries of development—or rather decay—the ghost of Michelangelo resurrected in books of anatomy can finally rest in peace. It seems to shake its "gory locks" as it vanishes into darkness in the left corner of the last engraving, as though to demonstrate that the sublime inscription on the catafalque of Michelangelo, *"Sic ars extollitur arte"*[39] is not always true.

36 Martino Martinez was one of the most eminent Spanish physicians of the eighteenth century, labelled the "Banner of Science." He was born in Madrid in 1684 and studied medicine in Spain. Became Professor of Anatomy in Sevilla and Physician to the King. After 1720 he was mostly occupied with questions regarding the improvement of education in anatomy and endeavored to set up an anatomical theatre in the general hospital. He died in 1734, before he could carry out his plans. *Cf.* Hirsch, *op. cit.*, vol. 4, p. 98.

37 Bryan, *op. cit.*, vol. 1, p. 698.

38 O'Neil, *op. cit.*, vol. 1, p. 166.

39 Vasari, *op. cit.*, p. 187.

American Attitudes Toward the Germ Theory of Disease (1860-1880)

PHYLLIS ALLEN RICHMOND*

IN the development of the germ theory of disease, the decades of greatest activity in Europe—about 1850 to 1880—coincided with a period of minimum activity in the United States. A glance at the etiological sections in American books and journals of these decades shows that the old miasmatic and atmospheric theories were still of paramount importance. The familiar explanations recur with monotonous regularity, involving miasmata, epidemic constitution, ozone, poisonous gases, and similar items.[1]

The miasma concept was now related to the notion of filth as an aid in transmission. The third and fourth National Quarantine and Sanitary Conventions, held in 1859 and 1860, gave physicians an opportunity to discuss matters relating to causation and contagion, and the views presented at these meetings show a complete absence of anything resembling an animalcular hypothesis. Each convention had a committee investigating "the nature and sources of miasmata," which faithfully turned in reports attributing fevers to decaying vegetation, to an invisible but detectable (method unstated) "malaria" or miasma, and to the presence of offensive effluvia from slaughterhouses, swamps, cesspools, and sewers—mostly the old factors previously enumerated by Benjamin Rush and other eighteenth century authors.[2] These views were only slightly modified during the following decades.

The prevailing opinions were well displayed in the vast literature on cholera. A rather typical view in 1866 was that of a writer in the *American Journal of the Medical Sciences.* In a general review of work on cholera, "D.F.C." (possibly D. Francis Condie of Philadelphia) noted two current theories:

> The opinion that cholera is propagatable through the medium of a specific poison contained in the dejections of patients labouring under the disease, is one entertained by a large number of writers on cholera, and many very imposing facts have been adduced in support of its correctness. By a

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1 Cf. Allen, Phyllis. Etiological theory in America prior to the Civil War. *J. Hist. Med.*, 1947, 2, 492-98.

2 *Proceedings and debates of the third national quarantine and sanitary convention. . . .* New York, 1859, pp. 226-27, *passim; Proceedings and debates of the fourth national quarantine and sanitary convention. . . .* Boston, 1860, pp. 6-8, 21-27.

few, however, it is maintained that the recent discharges from cholera patients are not infectious, but become so only after they have undergone decomposition.[3]

These two views will be recognized as those of the British epidemiologist, John Snow, and the Bavarian, Max von Pettenkofer. The cholera hypothesis of Pettenkofer appears to have made quite an impression in America. His work was cited in many of the cholera tracts, and one of his articles appeared in *Public Health* in 1873. Our reviewer, on the other hand, did not take much stock in either of the theories mentioned. He much preferred the view that cholera was a contagious disease, propagated by infected persons or their goods (fomites). The contagious material given off by the patients acted as a ferment in corrupting the atmosphere, particularly if the latter was in an "impure and stagnant state," and turned it into a carrier of the "morbific poison."[4] Such an idea was merely a repetition of an older atmospheric hypothesis. Also it indicates that the quarrel between the contagionists and the anti-contagionists was still going on. This long-term argument could not be settled until the specific causal factors in disease had been discovered.

There was, then, a general acceptance of the same old theories although these were somewhat modified by the newer ideas of Snow, Pettenkofer, or the King's College microscopist, Lionel S. Beale. The modifications appear in the etiologic section of the official report of the House of Representatives. *The Cholera Epidemic of 1873 in the United States,* published in 1875. In this report, a more or less chemical explanation seems to have been intended. The cause of cholera was listed as a specific organic poison, transmitted by the ejections of a person suffering from the disease (Snow's view). This poison went through a period of incubation outside the body in an alkaline environment "needed for renewing activity of the poison" (altered Pettenkofer). Its period of "morbific activity" was characterized by the presence of bacteria, though these were not specific (Beale's concept).[5] This etiological con-

[3] D.F.C. Review: Cholera, its pathology and treatment. *Amer. J. med. Sci.*, 1866, *n.s.* 52, 186.

[4] Pettenkofer, Max von. What we can do against cholera. *Public health: reports and papers 1873.* New York, 1875, pp. 317-35. For examples of the influence of Pettenkofer, see The etiology of typhoid fever. *Bost. med. surg. J.* 1872, *86*, 58-60; Brockett, L. P. *Asiatic cholera,* Hartford, Conn., 1866, p. 61; Collins, G. T. *The cholera, a familiar treatise on its history, causes, symptoms and treatment, with the most effective remedies.* New York and Cincinnati, 1866, pp. 50-63; Ely, W. S. *An essay on Asiatic cholera,* Rochester, N. Y., 1872, p. 10; Pancoast, Seth. *The cholera. Its history, cause, symptoms and treatment.* Philadelphia, 1873, pp. 11-18; D.F.C., *op. cit.*, 187.

[5] *The cholera epidemic of 1873 in the United States.* House of Representatives, 43d Congress, 2d session, Ex. Doc. no. 95. Washington, 1875, p. 8.

glomeration was probably as complete a synthesis as one could make without drawing on the germ or zymotic theories.

The atmospheric, chemical, and miasmatic theories so dominated etiological thought in the 1870's that when alternative views arose, as in the instance of a book review of James Ross's *Graft Theory of Disease,* American reviewers were cautious and noncommittal. A wait-and-see policy seems to have been almost universal. The case of Austin Flint, a New York physician noted for his work on diseases of the chest, is an interesting example. Flint was the author of a text, *Principles and Practice of Medicine,* long standard for medical students. As a young man he had reported on a typhoid epidemic near Buffalo in such a manner as to secure the attention of John Snow. In fact, Snow used Flint's report to illustrate the transmission of the disease through contaminated water. Flint himself accepted neither Snow's zymotic explanation nor the germ theory. He thought that water might contain an exciting agent of the disease, but not the specific cause. Yet in 1874, a friend believed that Flint was "strongly disposed to accept" an animalcular view.[6] In 1876, however, he published a popular article on medical and sanitary progress in *Harper's Magazine,* in which he dealt with the germ theory in the following terms:

> It is, indeed, claimed by some that the causation of certain diseases by specific organisms of microscopical minuteness has been demonstrated; by the majority of medical thinkers, however, the demonstrative evidence is not considered as complete.[7]

The germ theory was not introduced into Flint's textbook until the fifth edition (1881), and then it was suggested merely for relapsing fever and anthrax. Thus, following the conservative American attitude, he included the theory only when the demonstrative evidence was complete.

There was, of course, good reason to be cautious in accepting the germ theory. The original theory left much to be desired. It was difficult to understand and even more difficult to prove. Techniques had to be unbelievably exact. There was much in the theory that had to be developed and refined or discarded. It had different

[6] Hartshorne, Henry. *Amer. J. med. Sci.,* 1873, *n.s. 65,* 514-17; Flint, Austin. *Clinical reports on continued fever.* Buffalo, 1852; Relations of water to the propagation of fever, *Public health: reports and papers 1873,* 166-67, 172; Hurd, E. P. The germ theory of disease. *Bost. med. surg. J.,* 1874, *91,* 103. Footnote in this article refers to "Textbook of Practical Medicine, II, 621." This must have been the 1873 edition of the *Treatise on the principles and practice of medicine,* though specificity in etiology is mentioned rather than an actual animalcular viewpoint (4th ed., 105).

[7] Flint, Austin. Medical and sanitary progress. *Harper's Magazine.* 1876, *53,* no. 313, 70-84. Actually the demonstrative evidence was completed in 1876-77 by Pasteur and Koch.

applications to different kinds of diseases, but in the beginning this was not realized because so many maladies yielded their secrets at the first bacteriological onslaught. On the other hand, the problems of the germ theory should not have been beyond the intellectual capacity of a society that could produce a Josiah Willard Gibbs. The chief complaint against the American medical profession in this period (1860 to 1880) is the lack of any attempt at experimental work to prove or disprove the theory. This seems to have fitted the general cultural pattern of that age in science, apparently due partly to the lack of university educational facilities, partly to the pre-eminence of divinity and law as the favored professions for the intelligensia, and partly to the emphasis on applied science over pure science.[8]

Some Americans had been animalculists as students, but then turned away from the theory. Horatio C. Wood, Professor of Botany at the University of Pennsylvania, had such an experience, and his remarks about it give some clue to the reason for deserting the contagium vivum camp:

> In conclusion, perhaps it is allowable to state that some two or three years since the writer of this paper was very strongly inclined to believe in the doctrine of animate contagion, having imbibed it during his student life, and that this essay has not been the result solely of studies especially undertaken for the purpose; but that during the prosecution of other microscopic investigations, the evidence so gathered itself in his mind as to lead him into this by-path, and to leave him no doubt that general diseases are not caused by organic entities. There is a vast accumulation of negative evidence which repudiates the doctrine of animate contagion, either as taught by Linnaeus or by more recent authorities. There are no known facts establishing the doctrine; there are many such which strongly support the negative proposition.[9]

The use of microscopic investigations is interesting because in this case the very instrument that should have aided in proving the germ theory turned Wood against it. One is forcibly reminded that perfection in technique was urgently needed before any success could be obtained in establishing the germ theory.

[8] The author is at present compiling a bibliography of American pure research in nineteenth century science in an attempt to ascertain whether this view is justified. So far, a large amount of material has been found in the fields of geology and astronomy, but in the other sciences the yield has been meagre. Theoretical research contributions in geology and astronomy seem to have been incidental to and dependent upon the emphasis on these disciplines as applied sciences. Further work is expected to clarify this tentative conclusion.

[9] Wood, H. C. Examination into the truth of the asserted production of general disease by organized entities. *Amer. J. med. Sci.*, 1868, *n.s.* 56, 352. At the University of Pennsylvania Wood was Professor of Botany, 1866-76, Professor of Materia Medica, Pharmacy and Therapeutics 1876-1906, Professor of Nervous Diseases 1875-1902, occupying, as Oliver Wendell Holmes put it, "not a chair but a settee."

Wood's conclusion was reiterated as late as 1880 in a study on fever.[10] He admitted that there was a definite poison in cases of fever, "sometimes having formed in the system, sometimes having entered the organism from without." The latter idea was not pursued further, though possibly he might have been hinting at the zymotic hypothesis.

The fact that Americans of good repute professionally, such as Wood and Flint, dropped or failed to accept the germ theory does not mean that the hypothesis was totally lost in America before 1875. It is true that it was not adopted to any great extent. A few men, however, still fostered the concept and one new contribution was added by James Henry Salisbury of Cleveland, also known for his dietary contribution, the Salisbury steak. Salisbury's studies on fungi, which he believed caused various diseases, were probably the only original American papers utilizing the animalcular hypothesis to appear in the 1860-1875 period.

Salisbury began his experiments early in the 1860's and his first paper, on inoculation of measles by means of a straw fungus, appeared in 1862. Several other articles followed, notably the work on the spore of the *palmella* plant as a supposed cause of malaria. In 1868 he published a little volume on microscopic examinations of the blood, in which he presented his views on the various forms of fungi which he thought he had found in the blood in cases of smallpox, cowpox, typhoid, intermittent fever, and the remittent fevers. The form of his argument was logical enough, and his illustrations were interesting. As late as 1883, he put out a pamphlet on his opinions, but by this time they were a little outdated.[11] Of all this work, perhaps that on the *palmella* plant was the most typical.

In the malarious districts along the Ohio and Mississippi Rivers, Salisbury found algae or cryptogamous plants called *palmellae*

10 Wood, H. C. *Fever: a study in morbid and normal physiology.* Smithsonian contributions to knowledge. Washington, 1881, vol. 23, pp. 254-55.

11 Salisbury, J. H. Remarks on fungi, with an account of experiments showing the influence of the fungi of wheat straw on the human system: and some observations which point to them as the probable source of 'camp measles' and perhaps of measles generally. *Amer. J. med. Sci.*, 1862, *n.s. 44*, 17-28; On the cause of intermittent and remittent fevers, with investigations which tend to prove that these affections are caused by certain species of palmellae. *Amer. J. med. Sci.*, 1866, *n.s. 51*, 51-68; Description of two new algoid vegetations, one of which appears to be the specific cause of syphilis, and the other of gonorrhoea. *Amer. J. med. Sci.*, 1868, *n.s. 55*, 17-25; On the parasitic forms developed in parent epitheliel cells of the urinary and genital organs and their secretions. *Amer. J. med. Sci.*, 1868, *n.s. 55*, 371-80; *Microscopic examinations of the blood, and vegetations found in variola, vaccina and typhoid fever.* New York, 1868; Original investigations in diphtheria and scarlet fever, showing their kinship and cause to be the mucor malignans (a fungus in the exudations, blood, urine, and sputa), cured by quinine topically administered in powder, on the tongue and by inhalation. *Gaillard's med. J.*, 1882, *33*, 401-24. Also published in pamphlet form, New York, 1882, 1883, Detroit, 1883.

whose spores were easily discovered in the nearby air. Since these plants were always found in the ague lands, Salisbury came to the conclusion that if he could prove that malarial fevers always occurred after exposure to the spores of the *palmella*, and conversely, if there were no fevers where there were no *palmellae*, then he might have the solution to the malaria puzzle. He therefore made a series of experiments to attempt a proof of his hypothesis. He suspended material in the night air of malarious places and recovered the cells of the *palmella*. He found similar cells in the urine of patients suffering from malaria. To connect the two sets of observations, he tried a more drastic form of experimentation. This consisted in leaving boxes of *palmellae*-infested soil in the sleeping rooms of volunteers (on the window sills with the windows partially open) and these men subsequently caught malaria.[12] We can see, of course, that mosquitoes came in the open windows and bit them, but to Salisbury, whose experimental technique was not fine enough to control all possibilities, the result was adequate proof of his theory. An accidental example encouraged him. He left a box of soil in the office of another doctor by mistake and the doctor was taken ill with malaria. Salisbury used the microscope to search for his cryptogams, though he found the wrong type of organisms for his disease.

Encouraged by the reception given his research, especially in Europe, Salisbury carried his idea over to the etiology of other diseases, but his work was indecisive and not much came of it. As it was, after initial acceptance, his experimental evidence was refuted by others who found the *palmella* in localities where there was no malaria, showing it to be widely spread in nature. One of the most effective refutations was that of Horatio C. Wood, who opposed the cryptogamous theory in general and Salisbury in particular. He cited the work of Joseph Leidy in connection with J. K. Mitchell's hypothesis. Wood himself swallowed the *palmellae* without ill effects, and he used the microscope but could not find any of the cells in question. He was particularly disgusted with Salisbury's contention that he had found the fungi of syphilis and gonorrhea—pointing out that "of all the known diseases, the one, the natural history of which is most irreconcilable with the idea of a fungus as the cause is syphilis. Why is contact necessary for its passage from one individual to the other if spores or fungi be the cause?" Wood's objections were repeated by others, one of whom noted that Salisbury had failed to find *palmellae* in the blood of ague patients—"a

12 Salisbury, On the cause of intermittent and remittent fevers (note 11).

great lacuna in his theory." By 1872, the theory was termed unreliable."[13]

The case of Salisbury illustrates another difficulty in securing the acceptance of the germ theory. Fungi are now known to cause serious illnesses so that he was correct in associating fungi with disease. No fungi, however, are involved in the disease with which he was concerned. In so many instances, the animalculists had the correct idea but the wrong disease. This, perhaps as much as anything, discredited the germ theory. Pasteur and Koch finally were successful when they applied the theory to a relatively obscure disease, anthrax. In addition, the bacillus of this disease is a relatively large one and comparatively easy to cultivate. Problems involving the more common diseases, intermittent, remittent and continued fevers, typhus, and consumption were much harder to solve. Each of these has turned out to be, bacteriologically speaking, a whole collection of diseases, and the bacteriological differentiation, as in the case of pathological anatomy earlier, forced clinical differentiation. A similar situation apparently exists today in the present struggle to discover the causes of cancer.

Salisbury appears to have been the only American to have attempted serious experimental work in connection with the animalcular hypothesis in the period immediately following the Civil War. Most others did only what was necessary (in their own minds) to disprove his conclusions. No school of experimentalists followed him or was inspired by him. The stagnant situation in America continued.

One would have expected the learned journals to have picked up European developments and to have reported them widely, but this was not done. Little attention was paid to European bacteriology during the 1870's. The American journals of 1872, to take a sample year, were characterized by a primary concern with medical affairs in the United States. Foreign intelligence was reported, especially in the *American Journal of the Medical Sciences,* but this was taken in the form of abstracts of books or articles in foreign journals, or as letters from American students abroad. As a rule, there were no foreign contributors or reproductions from foreign work *in toto.* When Americans mentioned foreign work on the

13 Hirsch, August. *Handbook of geographical and historical pathology.* Tr. Charles Creighton. London, 1883, pp. 289, 291; Proust, A. *Traité d'hygiène publique et privée.* Paris, 1877, p. 728. See also *Canada Lancet,* 1872, *4,* 433-34. Wood. *loc. cit.* (note 9), 333-52. See also W. H. Harkness' Salisbury's ague theory. *Bost. med. surg. J.,* 1879, *n.s.* 2, (whole vol. 79) 369-75. Leidy, Joseph. *The flora and fauna within living animals.* Smithsonian contributions to knowledge. Washington, 1853, vol. 5, pp. 14-15; Hurd, *loc. cit.* (note 6), 104.

germ theory, a rare occurrence, they often chose to accept the arguments of those opposed to it—Beale, Pettenkofer, and others. The only mention of John Tyndall, in any of the four chief journals examined in detail, related to his visit to the United States, rather than to the particulars of his research.[14]

A few exceptions to this general situation may be found. The second *Annual Report* of the Massachusetts State Board of Health had come out in 1871, and in it anthrax was discussed. The views expressed are interesting:

> . . . it must be acknowledged that there are very strong grounds for inferring that the virus of charbon, like that of vaccine lymph and cowpox, consists of minute matter of unknown origin, which, under certain conditions, instead of undergoing chemical decomposition, is capable of preserving its activity outside the body and of being transferred as solid particles from place to place; but, having been introduced into the blood, becomes developed and multiplied, and thus causes the characteristic symptoms.
>
> This hypothesis, if accepted, is sufficient to enable us to explain how the disease may be communicated, and how, by the aid of certain chemical compounds, contagious matter may be neutralized or destroyed.[15]

Such an advanced outlook was very rare in American medical literature.

Four others added their contributions in the next few years. Christian W. Rauschenberg wrote an article in the *Atlanta Medical and Surgical Journal* for September 1872, on "Miscroscopic organisms as instigators of disease," which was cautious but favorable towards the germ theory. The article was written "with a desire to consolidate into a palatable form the most important general facts" known at the time, and it certainly achieved its purpose. In the following year, George M. Sternberg, later Surgeon-General, published an article on yellow fever in the *American Journal of the Medical Sciences,* advocating the germ theory in no uncertain terms, but *without mentioning any European work.* This seems odd in view of the wealth of support he could have drawn from this source. The 1873 *Annual Report* of the Smithsonian Institution also contained a favorable description of the germ theory, written by John Dalton, a New York physiologist, and in 1874 a

[14] *Amer. J. med. Sci., n.s. 64,* Quarterly summary of the improvements and discoveries in the medical sciences; *Bost. med. surg. J., 86, 87,* Foreign correspondence, Progress in medicine; *Chicago med. J., 29,* Selections. The *Trans. Amer. med. Ass.* for 1872 had nothing about foreign work in it. Tyndall's visit was reported in the *Bost. med. surg. J., 86,* 208. Reports and articles on germs can be found in the *Canada med. J., 8,* 65, 336, and the *Canada Lancet, 4,* 42-43, 554-55, both issued in 1872.

[15] *Second annual report of the State Board of Health of Massachusetts.* Public Doc. no. 37. Boston, 1871, pp. 96-97. In 1874, fungi and ferments were suggested as possible causes of cerebrospinal meningitis in the *Second annual report of the Secretary of the State Board of Health of the State of Michigan for the fiscal year ending Sept. 30th, 1874.* Lansing, 1874, pp. 140-42.

cautious article on the germ theory by E. P. Hurd appeared in the *Boston Medical and Surgical Journal.* All these writers, cautious or otherwise, were extremely courageous even in attempting to espouse so unpopular a cause.[16]

Throughout the nineteenth century, the few Americans who accepted the germ theory in one form or another believed in some sort of animalcular or fungus hypothesis. The zymotic theory was rarely mentioned, though infectious diseases were often termed "zymotic diseases." Francis Peyre Porcher of Charleston was an exception to this rule. His book, *Illustrations of Disease with the Microscope,* appeared in 1861. In the text, he stated that "scarlet fever, measles, small-pox, are each *sui generis,* are disseminated by exposure to special morbid poisons, working in the blood in the nature of a ferment, and which are peculiar in their nature."[17] Porcher's view is apparently the only American one, with the possible exception of Salisbury, showing acceptance of the doctrine of causal specificity, and his ferment idea is similar to Farr's early description of the zymotic theory of disease.

A contemporary of Porcher, E. P. Christian of Boston, wrote of a theory which he called "zymotic," but which lacked the doctrine of specificity. This use of the word "zymotic" again illustrates the confusion still existing in medical terminology. The idea of one specific "zyme" for each disease entity was not understood at all by Christian. His view was that "zymosis" was to typhoid, scarlet fever, erysipelas, diphtheria, and measles what "paludal malaria" was to intermittent, remittent, and continued fevers. In other words, a poison of one species (zymosis, malaria) could give rise to a number of different diseases. Thus the causes of all infectious diseases could be reduced to two or three basic poisons. Yet the genuine zymotic theory (involving the concept of a specific causal factor for each disease) was available in the British and especially in the French literature of the mid-seventies, if Americans had cared to read it.[18]

At a time when a real science of bacteriology was being developed in Europe, American etiology was virtually in the same

16 Rauschenberg, C. W. Miscroscopic organisms as instigators of disease. *Atlanta med. surg. J.,* 1872, *10,* no. 6, 358-59; Sternberg, G. M. An inquiry into the nature of the yellow fever poison with an account of the disease as it occurred at Governor's Island, New York harbor. *Amer. J. med. Sci.,* 1873, *65,* 398-406; Dalton, John. Origin and propagation of disease. *Ann. Rep. Smithsonian Inst.* [for 1873] Washington, 1874, pp. 226-45; Hurd, E. P. Germ theory. *Bost. med. surg. J.,* 1874, *41,* 97-110.

17 Porcher, Francis Peyre. *Illustrations of disease with the microscope.* Charleston, S. C., 1861, p. 79.

18 Christian, E. P. On the epidemic relationship of zymotic diseases. *Amer. J. med. Sci.,* 1862, *44,* 91-95; *Index-catalogue of the Library of the Surgeon-General's office.* Washington, 1888, 1st ser., vol. IX, pp. 259-60.

position it had been in for most of the century. A few animalculists can be found for the 1860 to 1875 period, but comparison of the research of Salisbury, for example, with that of Ferdinand Cohn strikingly shows how elementary this work was. In general, the germ theory was not accepted, and animalculists were either forgotten or mentioned only for ridicule. The earlier interests of the 1840's, which led to scientific experimentation and eventually to the germ theory of disease in Europe, had come to a dead end in America.

The doldrum decades preceding the 1880's are an American phenomenon. Why were American doctors so far behind Europeans in developing systematic medical research? And why did they fail to keep up with European developments in the field of bacteriology after 1860, when originally both had had much the same background? The answers to these questions seem to lie in the cultural scene.

During the first half of the nineteenth century, there was considerable interest in science in the United States. A movement was afoot to set up a national science foundation. The Wilkes Exploring Expedition and others were sent out. The Coast and Geodetic Survey was begun. The Smithsonian Institution was founded and at once began to turn out worthwhile contributions to science. The Lawrence Scientific School at Harvard and the Sheffield Scientific School at Yale were established. The lyceum movement caught the popular fancy and famous scientists like Agassiz and Lyell lectured all around the country. American medicine in this period was on a par with that of the more prominent European countries and American medical contributions of great significance were well received.

Then something went wrong. The scientific movement apparently petered out in the late 1850's. This may be blamed on the Civil War. It may also have been because fewer Americans went to European universities for their education and the native institutions were not strong enough to replace them. At any rate, in the 1870's there was a strong movement to improve the educational level and again to stir up an interest in science. Even as Simon Newcomb and others bewailed the American preoccupation with invention and practical science, the first real graduate school on the German pattern was being started at Johns Hopkins. The Hopkins provided a model for the other colleges and soon was called upon to supply their faculties. The whole American educational level was raised drastically in the last two decades of the century.

Before this movement took place, however, America lagged behind Europe in support of pure science and research. Little organized research was carried on in the United States during the nineteenth century, although there was considerable work on an individual basis. There were few laboratories, little decent equipment, and no funds for hiring capable assistants. Furthermore, no one saw any great need for such luxuries.[19] Practising physicians had no time for research, and emphasis was on practice to the detriment of experimental science.

Some excuse for this state of affairs may be made on the grounds that the country was new and the frontier took up the energies of men who might otherwise have turned to science. The supremacy of theology in the intellectual field may likewise have drawn the bright young men away from science.[20] Cultural independence in the arts and in literature was beginning to be apparent in the mid-century, and possibly this independent, nationalistic spirit was reflected in other fields, such as medicine, where American attitudes were unfavorable towards new ideas just at the time when the greatest advances were being made abroad.

In addition to these factors, there was little prestige to be gained in scientific research because the commercial spirit of the Anglo-Saxon world placed the emphasis on practice—a reflection of the businessman's sense of values. There was no tradition of government support for science, as in France, and the tradition of private support had to wait for a generation of multimillionaires. The thought of patronage was repugnant to democratic ideals, and respect was accorded to the sturdy, self-made scientist, following in the Franklin tradition, but without Franklin's viewpoint on what should be done with amassed wealth.

In such a milieu, even doctors trained abroad were soon absorbed into the general pattern. They found the odds too great and when, as in the case of the "Alabama Student," they tried to apply their acquired knowledge, it was too difficult to transform the whole environment into one more favorable for experimental efforts. To the dismay of European professors, some of their best

[19] For more detail, see R. H. Shryock's *American medical research: past and present*, New York, 1947, chap. 1, 2, and American indifference to basic science, *Arch. int. d'hist. d. sci.*, 1948, no. 5, 50-65. This was probably a matter of education. Few medical students had attended a liberal arts college and fewer still had much acquaintance with the physical and biological sciences. A good proportion of the medical profession lacked the basic knowledge necessary to set up a valid experiment or had any notion of how to interpret the results and data of an experimental proof. Americans were skeptical about the value of microscopy. Cf. Stillé, Alfred, *Elements of general pathology: a practical treatise on the causes, forms, symptoms and results of disease.* Philadelphia, 1848, p. 105.

[20] Hall, W. W. *Consumption.* New York, 1857, p. 223-24.

American students went home and were soon engulfed by their surroundings, making few if any contributions to medical advance.[21]

The emphasis on the practical in the American outlook demanded utility at a time when the doctors could promise the least. Pure science, represented in medicine by etiology and the identification of diseases, was not popular. "Cures" and treatment, based on empirical method, suited the public better. The necessity of following the public demand held back the development of medicine because treatment could not be successful, except by chance, when the causes of disease, or even the nature and identity of the diseases themselves, were unknown. Philosophically speaking, this meant that physicians were asking the wrong questions, so that any possible solution to the problems of etiology was limited in scope by the narrowness of the field of inquiry. For example, the epidemiological approach and statistical surveys had been the methods of the early part of the century and these were continued in professional literature even though they were known not to provide a satisfactory account of the etiology of any disease. The emphasis on applied science over pure science was a case of putting the cart before the horse, but one could scarcely expect the public to realize this when the medical profession itself did not do so.

The intellectual climate was obscured by the use of an inadequate and confusing terminology. The precise meaning of the terms used in science in preceding centuries is difficult for the modern reader to grasp because concepts were expressed in a language which appears tantalizingly vague and inexact when compared with present-day terminology. This is especially true of work in medical theory. A striking example of this may be found in some textbooks of the mid-nineteenth century. J. V. von Hildenbrand of Vienna wrote the following passage on etiology:

> Every contagious miasm possesses the properties, 1, of producing a similar virus in the disease which it had occasioned; and 2, of spreading and extending itself ad infinitum, by virtue of this secondary development, that is so long as there exists a matter capable of receiving the miasm, and of producing a new one. Both these properties are similar, by their power of reproduction, to the germs of animals and of plants; but the last property is analagous to the matter of fire, since a single atom of the contagious virus, like a spark, is capable of spreading itself ad infinitum, and of transversing, when unobstructed in its progress, all bodies that are capable of receiving it.[22]

[21] Men coming to this country to teach found things equally difficult, a fact illustrated by the adventures of Charles Edouard Brown-Séquard at Harvard. See J.M.D. Olmsted's *Charles Edouard Brown-Séquard, a nineteenth century neurologist and endocrinologist*, Baltimore, 1946, pp. 123-38.

[22] Hildenbrand, J. V. de. *A treatise on the nature, cause and treatment of contagious typhus*. Trans. S. D. Gross. New York, 1829, p. 73.

The difficulty of expressing scientific ideas with inadequate terminology is well illustrated in this paragraph. Hildenbrand used "miasm," "atom," and "virus" all to convey the same basic idea.

Poor instruments, as well as legal, organizational, and commercial obstructions also hindered medical progress in America. Optical instruments such as microscopes were rare and of poor quality until the last few decades of the century. Their worth as scientific instruments rather than as toys was just beginning to be appreciated. It was unlawful to perform autopsies in some states. American democratic principles would not allow experiments to be made with charity patients. Commercial hindrances came from two sources: the quacks (including patent medicine sellers) who would have lost a good part of their market if the medical profession had been able to satisfy the intelligent members of the general public, and the trading companies, which suffered under the quarantine and public health regulations. The removal of the "brutal" port quarantines from Boston and New York in 1859 was hailed as a great victory for commerce and "the welfare of mankind, second only to the Declaration of Independence in Philadelphia, nearly a hundred years ago."[23]

The lack of the scientific point of view is evident in the case of one scientist who found that he suffered from a headache every time he worked with fungi. So he desisted, saying he was "unwilling to test Mitchell's [cryptogamous] theory by so strictly personal an experiment."[24] How different this attitude was from that of Europeans who were practising self-inoculation for the purposes of answering similar questions.

At this time the quality of personnel in the medical profession was at a low level. All kinds of sects flourished and their existence discredited the profession as a whole. Medical schools were abundant, but extremely poor in both curriculum and students. Small colleges that were virtually diploma mills turned out graduates to "practise" (and learn) on their unfortunate patients. In the present state of medical excellence it is hard to imagine the degree to which the profession had sunk. In the early part of the century, most of the better doctors were educated abroad, at Paris and Edinburgh. In the middle period, few left America. When, in the latter part of the century, it became apparent that Germany and France led the

[23] Jackson, Samuel. *The principles of medicine.* Philadelphia, 1832. Pref., xvi-xvii; *N. Y. J. Med.*, 1859, *4*, 159; *Proc. & deb. 4th nat. Quar. San. Conv.*, 14.

[24] R. *So. Quart. Rev.* 1850, *n.s. 1*, 155-56.

world, students once more went overseas to prepare themselves for careers in medicine.[25]

Finally, whatever American discussion of European work on the germ theory existed (and this was very scarce) generally centered upon the ideas of men who refused to accept the hypothesis, or the opinions of those who espoused some variant of it, because they maintained the older views. Since experiments to prove or disprove etiological theory were performed only rarely in the United States, and were almost total failures when they were tried,[26] American physicians thought they were being very objective and scientific in *not* jumping to conclusions. This was a normal reaction, considering how inconclusive their evidence was, but one wishes some attempt had been made, instead, to improve the experimental level. The Europeans evolved the germ theory because they were looking for it, or something like it, to explain causation in infectious diseases. Americans looked a few times—unsuccessfully—and gave up.

Perhaps it is not entirely fair to place so much blame on the American scientific attitude for the failure to contribute to the early development of the germ theory. Most of the criticisms of the hypothesis were valid. It did not explain the peculiar characteristics we now know are due to rickettsial organisms or viruses, to the fungi, protozoa, and other living organisms, to the insect and animal or even avian vectors, to the concept of the carrier, and to immunity. It took nearly thirty years to demonstrate the correctness of John Snow's intuition concerning the malarial parasite. While eventually there was agreement on the transmissibility of many diseases before the acceptance of the germ theory, on others there was controversy. One finds, for example, elaborate quarantine and sanitary cordons utilized during the early pandemics of cholera, and for yellow fever, but by the mid-century these were dropped. Precautions against person-to-person contact were replaced by sanitary precautions designed to clean up foul miasmata. Where a disease, such as smallpox, measles, or scarlet fever, was accepted as transmissible, the agency of transmission was believed to be an effluvia—a poisonous gas in the breath or exuded from the pores—rather than a living organism. It is interesting that where attempt was made to obtain organisms from the breath of a patient, it was

25 For details, see Shryock, *Medical research*, chap. 1, 2; for medical education see W. F. Norwood's *History of medical education in the United States before the Civil War*, Philadelphia, 1944.

26 Experimentalists included Benjamin Rush Rhees, Joseph Leidy, Francis Peyre Porcher, James H. Salisbury, and others. See also Stillé, *Elements of pathology*, p. 105.

done in a case of cholera, or other disease not likely to be spread in this manner. This again illustrates the complexity of the problem. The development of the germ theory also prospered in Europe because of the constant interchange of scientific ideas. Largely for reasons of distance, Americans did not take any share in this spirited idea market.[27]

The lively controversies over the germ theory of disease in Europe should have focused American attention on the hypothesis. Unfortunately, up to about 1875, the American medical profession was not interested. Articles in the journals reflected concern over practical problems, such as treatment and techniques, rather than over theoretical problems, such as the etiology of specific infectious diseases. The old miasma hypothesis was generally accepted and even earlier work on the differentiation of miasmata was forgotten. Classification of disease entities had retrogressed to a point where the phenomenon of typho-malarial fever was frequently encountered, thus ignoring the careful study of Elisha Bartlett thirty years earlier. To judge from American medical periodicals, the new science of bacteriology scarcely existed.

Around 1875, however, this situation began to change. Some knowledge of the work on bacteriology abroad seeped in, although American thinking on the matter was still quite confused. Fifteen medical journals have been examined for the 1875-1880 period to determine the degree to which the germ theory was being publicized. It appears that there were two or three items about the theory in almost every journal—either articles, editorials, book reviews, or bits of news—during the five-year period, *an average of one item every other year.* These references were not necessarily favorable towards the new idea, but at least it was being mentioned, which was more than had been done heretofore.[28]

[27] [Snow, John.] *Snow on cholera, being a reprint of two papers by John Snow together with a biographical memoir by B. W. Richardson, M.D. and an introduction by Wade Hampton Frost, M.D.* New York, 1936. *"On the mode of communication of cholera,"* p. 133; Fenner, E. D. *History of the epidemic yellow fever at New Orleans, La. in 1853.* New York, 1854. Addendum, p. 84; *Proc. & deb. 3rd nat. Quar. Conv., 1859,* 44, 201, 15-85; *Proc. & deb. 4th nat. Quar. San. Conv.,* 1860, 72-73, 113-17; Buckler, T. H. *A history of epidemic cholera as it appeared at the Baltimore City and County Alms-House, in the summer of 1849, with some remarks on the medical topography and diseases of this region.* Baltimore, 1851.

[28] The journals (1875-1880) consulted were: *American Journal of the Medical Sciences* (4 items), *American Practitioner* (2 items), *Boston Medical and Surgical Journal* (5 items), *Detroit Lancet* (4), *Eclectic Medical Journal* (5), *Medical and Surgical Reporter* (7), *Medical Annals: Albany* (1), *Medical News* (2), *Medical Record* (1), *Therapeutic Gazette* (1), *Transactions of the American Medical Association* (2), *Transactions of the Eclectic Medical Society of New York* (2), *Transactions of the Homeopathic Medical Society of New York* (2), *Buffalo Medical and Surgical Journal* (0), *Gaillard's Medical Journal* (0). There are some articles available in medical journals other than these, of course.

Publications such as *The Boston Medical and Surgical Journal, The American Journal of the Medical Sciences, The Eclectic Medical Journal,* and *The Detroit Lancet* each contained four or five articles and news reports on the germ theory—chiefly in opposition to it. *The Medical and Surgical Reporter,* on the other hand, had seven items on the theory during the 1875-1880 period, and all were favorable. Pasteur, Koch, Klebs, and Lister were mentioned, as well as Bastian and Beale. The other journals of the day usually had one or two papers or informative notes on the theory, especially towards 1880, but as yet, etiological references utilizing non-germ explanations outnumbered germ theory citations by at least ten to one.

The real acceptance of the germ theory began with the appearance of an English translation of Hugo W. von Ziemssen's *Cyclopedia of the Practice of Medicine* in 1874-1878. The first volume of Ziemssen employed the germ theory in relation to both anthrax and relapsing fever and suggested its pertinence to several other diseases. By 1878, the Ziemssen influence was apparent at the meetings and conventions, as illustrated by the paper given by John T. Carpenter at the 29th annual session of the Medical Society of the State of Pennsylvania.[29] Before that time, it was a rare American dictionary or encyclopedia or even textbook which contained any mention of the germ theory.

A study of some of the representative textbooks between 1875 and 1885 shows clearly how long it took for the new concept to be presented. Henry Hartshorne's *Conspectus of the Medical Sciences,* in the second edition (1874), contained some interesting comments on the etiological theories of his day. He accepted the usual human effluvia (contagion), or "crowd poison," and filth explanations for the origin of typhus, and miasma for yellow fever. He followed the views of Pettenkofer and Thiersch on cholera, and (interesting point) of John K. Mitchell on intermittent fever.[30] Hartshorne was a well-informed Philadelphia physician and a frequent contributor to medical journals. He knew of the work of most European writers on the subject of etiology, but he accepted only that opposed to the germ theory.

[29] Carpenter, J. T. The local origin of constitutional disease. *Trans. med. Soc. St. of Pa. 29th ann. session* 1878, *12,* pt. 1, 140. For opposite view, see Davis, N. S. Does etiology constitute a proper basis for the classification and diagnosis of diseases? *Amer. Practitioner,* 1876, *13,* 343-50. Davis argued that the Ziemssen classification, based on etiology, was erroneous.

[30] Hartshorne, Henry. *A conspectus of the medical sciences, comprising manuals of anatomy, physiology, chemistry, materia medica, practise of medicine, surgery and obstetrics.* 2d ed. Philadelphia, 1874, pp. 592-93, 603, 607, 612, 616.

Some of the texts in the early 1880's illustrate the gradual replacement of old ideas by new ones. Austin Flint finally included the germ theory for relapsing fever and anthrax in the fifth edition of his *Treatise on the Principles and Practice of Medicine* (1881), and in 1883 added Koch's tuberculosis discoveries as an appendix, while retaining the older miasma hypothesis for other infectious diseases. In a different book, *Clinical Medicine. A Systematic Treatise on the Diagnosis and Treatment of Diseases* (1879), Flint called attention to the fact that "a peculiar vegetable organism" had been observed in the blood during paroxysms of relapsing fever. He wrote that "if the demonstration be accepted as regards this disease, reasoning by analogy, it is a logical conclusion that it is merely a question of time in regard to the demonstration of the germ theory in regard to its application to other fevers."[31] The student who used this book was being prepared for the new etiology, and it would have come as less of a shock than to one having a more conservative text.

Other texts were really conservative. In 1884 there appeared an American edition of Edmund A. Parke's *A Manual of Practical Hygiene* intended for military use. According to the preface, some Americans had expressed disappointment because earlier editions did not have any material on the germ theory. By this date they were anxious to hear of this work. The new edition did not answer this criticism, and in spite of the date of publication, there was not one word about the work of Robert Koch on cholera, although Pettenkofer was cited frequently. Where the "germ theory" was mentioned, the author either included material to prove that it was *not* correct, or else he chose examples, such as the Klebs *bacillus malariae,* which had been shown to be incorrect or premature.[32]

The textbook writers were by no means the only ones who were slow in adopting the germ theory. In the 1870's, most Americans who even considered this hypothesis accepted the views of those Europeans, such as Max von Pettenkofer, Charleton Bastian, or Lionel S. Beale, who opposed Pasteur. The most exotic types of theory seem to have made a greater impression in the United

31 Flint, Austin. *A treatise on the principles and practice of medicine.* Philadelphia. 2d ed., 1867; 3d ed., 1868, p. 103; 4th ed., 1873, p. 105; 6th ed., 1886, preface, p. 3; Flint, *Clinical medicine. A systematic treatise on the diagnosis and treatment of diseases.* Philadelphia, 1879, p. 699.

32 Parkes, E. A. *A manual of practical hygiene for the use of the medical service of the Army.* Ed. F. S. B. François de Chaumont. New York, 1884, vol. 2, pp. 129-30, 134; Flint, Austin. *A treatise on the principles and practice of medicine.* 5th ed. Philadelphia, 1881, pp. 94-95.

States than the scientific results of Pasteur, Ferdinand Cohn, Joseph Lister, and John Tyndall. Lister gave a paper on the antiseptic system and the germ theory at the Philadelphia Centennial Exhibition, but it was not well received. Tyndall's lectures influenced amateur scientists and were reported extensively in the *Popular Science Monthly*, but not in the more learned and pretentious scientific and medical journals.[33] While one can easily blame this state of affairs on the weaknesses of the germ theory, it does seem rather odd that the general atmosphere in medical circles was so completely hostile to the new views. There was no partisan bickering over the hypothesis as one might have expected. The uniformity of opinion is an American phenomenon.

It was quite possible in the late seventies to write of infectious disease without mentioning germs at all.[34] Some writers cited the theory only to condemn it. In 1879 the *American Quarterly Journal of Microscopical Science* carried a review of an article in the *New York Medical Journal* by Dr. H. D. Schmidt. This physician observed that:

> The microscopical study of disease-germs *has not been very prolific in practical results,* and the question as to the existence of specific germs of this character is yet an open one. Investigations of the causes which produce disease are probably among the most difficult and *unpromising* of any which the microscopist can undertake. . . .
>
> On the whole, it appears that the application of the hypothesis of contagium vivum to the explanation of the phenomena of disease, has had its day.[35]

The reviewer of the article, presumably a layman, accepted Schmidt's views without question.

While some authors ignored the germ theory, a few were so confusing in their presentation of it that their explanations were a worse hindrance to understanding than total omission would have

33 Bailey, T. H. Water-poisoning as a cause of disease. *The Sanitarian*, 1875, *3*, no. 27, 97-107; Boulden, J. E. P. Cholera—its cause and prevention. *The Sanitarian*, 1873, *1*, no. 8, 362-67; Anonymous. The etology of typhoid fever. *Bost. med. surg. J.*, *86*, 58-60; Richardson, Joseph G. On certain human parasitic fungi and their relation to disease. *Bost. med. surg. J.*, *86*, 158-60; *2d ann. rep. St. Bd. Health Mass.*, 1871, 112-14; Lynch, J. S. The germ theory of disease. *Balt. Phys. Surg.*, 1873, *4*, no. 3, 17-18; Jordan, E. O. The relations of bacteriology to the public health movement since 1872. *Amer. J. Pub. Health*, 1921, *11*, 1042-47; *Pop. Sci. Mo.*, 1876, *8*, 686-99; 1876, *10*, 129-54; 1877, *10*, 641-54; 1877, *11*, 236, 363.

34 Hudson, E. D. The pathology and etiology of pulmonary phthisis in relation to its prevention and early arrest. *Trans. N. Y. Acad. Med.* 2d ser. 1876, 2, 147-59; Carpenter, *loc. cit.* (note 29), pp. 138-143; Cushing, Harvey. *The life of Sir William Osler*. New York, 1940, p. 164.

35 Review: Dr. H. D. Schmidt on the nature of the poison of yellow fever and its prevention. *Amer. Quart. micros. J.*, *1*, no. 4, 315-16. Italics mine.

been. Frank Wells, Cleveland Public Health Officer, wrote that Liebig, Virchow and the majority of English writers claimed that

> certain disorders, notably the zymotic diseases, spring spontaneously from filth; and hence, being *entirely* amenable to sanitary laws, have been designated by them "filth or preventable diseases"; the other [school], following Pasteur and upheld by Liebermeister, Pettenkofer, and the greater portion of the German school, believe that filth does not directly originate these affections, but simply increases a tendency to their causation, by furnishing a nidus or resting place, a favorable soil, in which the living organisms of disease multiply and develop and without which they become as a rule inert and inoperative. In other words, the one class believe that filth *alone,* communicating the elements of decomposition, is sufficient to produce disease, while the other hold that there must be something more, viz. filth plus some particular poison. Pettenkofer, the warm supporter of the "germ" theory of disease, says that filth is like the charcoal in gunpowder. *It is necessary to have it, in order to produce the explosion.*[36]

If the first group included were supposed to be zymoticists, the author did not have a very clear idea of the zymotic hypothesis. His whole discussion of the second school of thought shows little knowledge of the germ theory as presented by Pasteur. There is no sign that he saw any difference between the views of Pasteur and of Pettenkofer. The spontaneous generation question is brought in in an unusual fashion to support the epidemiologists. Basically, it would appear that Wells had a fine misunderstanding of all the questions of his day: the germ theory, the doctrines of Pasteur, the zymotic hypothesis, and the relation of the filth theory to epidemiology. The favorable mention of Pettenkofer lends support to the impression that Americans chose the wrong side in the European controversy over the germ theory.[37]

It was during the seventies that there was so much preoccupation with the problem of sewer gas. The *Canada Lancet* reported that the Prince of Wales contracted enteric fever (typhoid) in 1872, while on a visit to the home of Lord Londesborough. It was thought that there must have been some defect in drainage causing water pollution or the generation of sewer gas. The gas was assumed to be dangerous because it smelled unpleasant and, with the development of sanitation, it was now frequently associated with disease, particularly typhoid. Many of the articles in the *Plumber and Sanitary Engineer* for the 1875-1880 period indicated

[36] Wells, Frank. *Filth and its relation to disease. A report made to the Board of Police Commissioners of the City of Cleveland.* Cleveland, 1876, pp. 5-6.

[37] There was an article by Max von Pettenkofer, "What we can do against cholera," in *Public health: reports and papers 1873,* 317-35, in which he gave practical directions on the prevention of cholera, stressing the importance of cleanliness of water, soil, and air, although he thought that drinking water had nothing to do with the spread of the disease.

great concern over sewer gas poisoning and its prevention by means of "stench traps."[38]

In 1880, Benjamin Lee addressed the Medical Society of the State of Pennsylvania on hygiene, and he blamed sewer gas for typhoid, rheumatism, pneumonia, parotitis, malaria, croup, and diphtheria. No mention was made of germs or any other possible contents of this gas. He stated:

> Whatever the agency by which it works, we know that it comes with the power and potency of death. Escaping into the free atmosphere, its deadly poison is quickly destroyed by the oxidation of its organic poisons; but when it mingles with the confined air of our unventilated living and sleeping rooms, it retains its deadly power long enough to do its work effectually.[39]

It will be recognized at once that this is merely the old concept of a noxious miasma transferred to a new kind of vapor. An effective refutation of this kind of thinking was made by George Hamilton, and especially by J. M. Keating, in a paper and discussion published in the *Transactions of the College of Physicians of Philadelphia* for 1883.[40] By that time, the germ theory was beginning to be accepted universally.

Another element in the American picture concerns the adoption of the antiseptic system. This method of Lister was used reluctantly in the late 1870's because it worked. Apparently few Americans had any idea why it was effective. From articles on the antiseptic procedure in medical journals during the years 1876 to 1881, one would never guess that the germ concept even existed.[41] This is one of the most interesting illustrations of the general American ignorance of European work in the period following the Civil War. Here the practical and visible results of the germ theory of disease were accepted without the theory itself.

[38] *Canada Lancet*, *4*, 233-34. See also, Wells, *Filth and its relation to disease*, 53; Keating, W. V. An epidemic of typhoid fever from defective drainage. *Trans. Coll. Phys. Phila.*, 1879, 3d. ser., *4*, 85-125; Hartshorne, Henry. Preliminary report on the sanitary conditions of American watering places. *Public health: reports and papers*, *2*, 56, 57; Noel, H. R. Sewer-gas as a cause of diphtheria and typho-malarial diseases, *ibid.*, 362-67; *The Plumber and Sanitary Engineer*, 1878, *1*, 32, 34; *2*, *3*, *4*, *passim*. Later this magazine was called *The Sanitary Engineer*.

[39] Lee, Benjamin. Address in hygiene. *Trans. med. Soc. St. Penn.*, *13*, pt. 1, 121.

[40] Hamilton, George. Sewer gas and its alleged causation of typhoid fever. *Trans. Coll. Phys. Phila.*, 1883, 3d ser. *6*, 270ff.; Keating, J. M. Discussion, *ibid.*, 301-2.

[41] Pepper, William. The sanitary relations of hospitals. *Trans. Amer. Pub. Health Ass. 1874-5*. New York, 1876, *2*, 1-10; Smith, Stephen. Some practical tests of the claims of the antiseptic system. *Trans. med. Soc. St. N. Y. 1878*, 106-30; Parrish, W. H. Puerperal septicaemia. *Trans. med. Soc. St. Penn.*, 1880, *13*, pt. 1, 222; Snively, Isaac. Hygiene in its relation to the medical profession. *Trans. med. Soc. St. Penn.*, 1881, *13*, pt. 2, 666; Ewing, J. H. Cases treated by the antiseptic method in St. Mary's Hospital, Philadelphia. *Amer. J. med. Sci.*, 1879, *77*, 416-29.

Very often it seemed as if laymen had a better grasp of the germ theory than members of the medical profession. This was not strange when one considers the low status of medical education in America during most of the nineteenth century. Amateur scientists were also among the forefront of the writers of books on the microscope, but this was partly because microscopy was an interesting hobby. In 1875, President Barnard of Columbia University was called upon to speak before the first convention of the American Public Health Association. His address, "The germ theory of disease and its relation to public hygiene," was extremely enlightening. He described the germ theory and the controversy over spontaneous generation. The latter he regarded as solved by Charleton Bastian, though he recognized that further work was necessary before it could be fully settled. He was well acquainted with the research of Pasteur, and Lister's antisepsis, and he was sure that the germ theory was "at least partially true." He was one of the few Americans to mention such European leaders as Schwann, Tyndall, and Klebs, and he was entirely open-minded about the whole subject.[42]

Laymen did more than accept the germ theory—some of them attempted to make their own contributions. In England, for example, in 1850 John Grove had introduced his theory of vegetable germs, which was strongly influenced by the cryptogamous theory of John K. Mitchell. In America at least three laymen had something to add to the theory. The minute yellow cholera flies of J. Franklin Reigert of Lancaster, Pennsylvania, were an unconscious attempt to link the disease with water. Another layman, William D. Riley, attributed diseases to the metamorphoses in locusts and grasshoppers. He was startlingly ignorant of the elements of biology, and it is doubtful that his essay had much influence.[43]

The most significant development in American microbiology before the general acceptance of the germ theory was the discovery

42 Barnard, F. A. P. The germ theory of disease and its relation to hygiene. *Public health: reports and papers, 1873,* 70-87. Books on the microscope for amateurs included: King, John. *The microscopist's companion; a popular manual of practical microscopy.* Cincinnati, 1859; Mantell, Gideon. *Thoughts on animalcules, or a glimpse of the invisible world revealed by the microscope.* London, 1846; Hon. Mrs. Ward, *A world of wonders revealed by the microscope. A book for young students.* 2d ed. London, 1859; Wood, Rev. J. G. *Common objects of the microscope.* London, 1861; Wythe, Rev. J. H. *Curiosities of the microscope, or illustrations of the minute parts of creation, adapted to the capacity of the young.* Philadelphia, 1852; Brocklesby, John. *Views of the microscopic world. Designed for general reading and as a hand-book for classes in natural science.* New York, 1851. *The amateur microscopist; or views of the microscopic world. A handbook of microscopic manipulation and microscopic objects.* New York, 1871.

43 Grove, John. *Epidemics examined and explained: or, living germs proved by analogy to be a source of disease.* London, 1850, pp. 88-90, 128-37, 154; Reigert, J. F. *A treatise on the cause of cholera. An interesting discovery.* Lancaster, Pa., 1855; Riley, W. D. *Locusts and grasshoppers. The beginnings and the end of febrile or eruptive diseases in living things.* Philadelphia, 1872, pp. 4-5.

of the bacterial nature of pear blight, made by Thomas J. Burrill in 1878.[44] Burrill, an Illinois biologist interested in bacteria and fungi, did not publish his work fully, and little notice seems to have been taken of it. In 1882, he brought out a small volume, *The Bacteria,* which was of considerable moment. His experimental method was similar to that of Robert Koch, and it is important to note that it may have been thought out independently because it is unlikely that Burrill had seen the Koch postulates (also published in 1882) before the publication of his own work.

Even before Burrill's research on pear blight, William G. Farlow had discovered the causal factors in American grapevine mildew and potato rot. Later Farlow and Arthur B. Seymour were to compile an encyclopedia of the parasitic fungi of the United States, classified according to their hosts. Followers of Burrill included Merton B. Waite (insect transmission of pear blight bacteria), Joseph C. Arthur (further research on pear blight), Newton B. Pierce (California vine disease, walnut blight), and Erwin Frink Smith (wilt disease in curcurbits, *Bacteria in Relation to Plant Diseases.*) The latter is famous as the man involved in the argument (1898-1901) with Dr. Alfred Fischer of the University of Leipzig as to whether bacterial diseases of plants actually exist. In this case Americans had to persuade Europeans to adopt the germ theory for plants![45]

Perhaps as a reflection of the lay interest in bacteria, nonmedical publications often carried news of medical interest. A later paper of Tyndall on germs, read before the Royal Society, was abstracted in 1876 in the *American Journal of Microscopy,* the *Popular Science Monthly,* and the *American Journal of Science and the Arts.* Many lectures of Tyndall were reported in full in the two latter journals. It is interesting to see the degree to which the amateur and professional scientists opened their magazines to news of the germ theory, in contrast to what amounts to a conspiracy of silence on the part of medical editors. The *Popular Science Monthly* had at least one article in each volume, beginning in 1874. This meant

[44] Smith, E. F. In memoriam Thomas J. Burrill. *J. Bact.,* 1916, *1,* 269-71. Burrill, T. J. Pear blight. *Trans. Ill. St. hort. Soc. for 1877.* Chicago, 1878, pp. 114-16; Fire blight of pears. *Trans. Ill. St. hort. Soc. for 1878.* Chicago, 1879, pp. 79-80; Anthrax of pear trees; or the so-called fire blight of pear, and twig blight of apple, trees. [1880] *Proc. Amer. Ass. Adv. Sci.,* 1881, *29,* 583-97; Bacteria as a cause of disease in plants. *Amer. Nat.,* 1881, *15,* 527-31; Blight, [1881] *Bot. Gaz.,* 1880-81, *5* & *6,* 271-73; Some vegetable poisons [1882] *Proc. Amer. Ass. Adv. Sci.,* 1883, *31,* 515-18, *Amer. J. Micr.* 1882, *3,* 192-97; *The bacteria.* Springfield, Ill., 1882. 11th Ann. Rep. Ill. Indust. Univ. 65 pp.

[45] Rodgers, A. D., III. *Erwin Frink Smith. A story of North American plant pathology.* Memoirs of the American Philosophical Society, vol. 31. Philadelphia, 1952, pp. 342-44, 346-52.

a minimum of two items *per year* as compared with two or three items for a five-year interval in medical journals. By 1882 (volume XX) no less than ten items on the subject were included. Three of these were articles presenting the researches of Pasteur, while others were notes on nomenclature of microbes, the nature of diphtheria poison, Laveran's discovery of the malarial parasite, and Pettenkofer's soil doctrine.[46] There was no excuse for a reader of the *Popular Science Monthly* not being well informed about the latest developments regarding the germ theory.

The readers of the *Scientific American* should have been equally well informed. This journal not only carried short articles and news items about the germ theory, and especially about bacteria, but in its *Supplement* there appeared longer articles by Pasteur and others on the very latest developments. The *Supplement,* in fact, had more medical articles than the main periodical, very often, as in the *Popular Science Monthly,* written by leading scientists and physicians of the day. While the main section of the *Scientific American* seemed more amateurish and less erudite than the *Popular Science Monthly,* the *Supplement* left nothing to be desired. It contained scientific papers of a caliber one would expect to find in a learned journal.[47] Both popular periodicals were far more receptive to new ideas than the medical journals.

The germ theory also reached the public through newspaper supplements such as the *Tribune Popular Science.* As early as 1874, an account of a lecture on the germ theory appeared. The concept was often presented in a more favorable light in popular accounts, such as this, than in more serious scientific journals.[48]

The *American Journal of Science and the Arts* (Silliman's Journal) was primarily a periodical for physical scientists and biologists, and few articles of medical interest were printed in it. Nevertheless, articles on parasitic worms, cholera, the microscope, diseases caused by fungi, and Tyndall on germs were included. *The Sanitarian,* a public health journal, had some mention of the germ theory, especially in articles on specific diseases, in editorials or book reviews. In spite of this evidence of interest, notice of Koch's

[46] Professor Tyndall on germs. *Amer. J. Micr.,* 1876, *1,* no. 4, 33-46; *Amer. J. Sci.,* 1876, 3d ser. *11,* 305ff.; 1877, *13,* 477, 480; 1879, *15,* 235; *Pop. Sci. Mo.,* 1876, *8,* 686-99; 1876-77, *10,* 129-54, 641-54; 1882, *20:* Max von Pettenkofer, Sanitary relations of the soil, 332-40, 468-77; Sketch of M. Louis Pasteur, 823-29; Louis Pasteur, The germ theory, 801-6; Nature of diphtheria-poison, 714; Vaccination for anthrax, 142-43; Accommodative cultivation of infectious organisms, 424-5; William B. Carpenter, Disease-germs, 244-60; Malarial organisms, 857-58; Glossary of microbes, 718.

[47] *Sci. Amer.,* 1875-1880, vols. 32-43; *Sci. Amer. Suppl.,* vols. 1-10.

[48] *Tribune Pop. Sci.,* Boston, 1874, pp. 59-60.

work on the germ theory was *quoted* from the *American Naturalist,* another scientific magazine, rather than abstracted from any published material of the German scientist. The editors of *The Sanitarian* were physicians, and this neglect was similar to that of their colleagues editing purely medical journals. References about the germ theory were also infrequent in the reports and papers submitted to the American Public Health Association in the seventies. Though there were many articles on individual epidemics and on insanitary conditions and their remedies, little was said regarding the bacteriological factors involved. In this instance, as in the case of the medical journals, other interests occupied the physicians.[49]

Other nonmedical journals carried news of the bacteriological activities in varying degrees. Literary magazines such as the *Atlantic Monthly, Harper's Magazine,* and the *North American Review* had very few articles on scientific subjects. Those of medical interest related chiefly to cholera and yellow fever. *The Nation* had a whole section devoted to scientific news, though it must be admitted that this was mainly about technical improvements and inventions. Articles on disinfection, cholera, and the health of great cities appeared. *The International Review* for 1880 contained an article on yellow fever by John S. Billings, of Army Medical Library fame, favorably mentioning the germ theory. Journals in fields which might be affected by medicine were somewhat unreceptive to the theory. *The Journal of Social Science, The Plumber and Sanitary Engineer,* and *The American Architect and Building News* had very little or nothing on the hypothesis. It was the reader of the popular science magazines who learned the most about it.[50]

All this was changed suddenly in the early 1880's. After the cautiousness of the medical profession in the post-Civil War period, the final acceptance of the theory came almost immediately after Koch's demonstration of the tuberculosis bacillus and the statement of his postulates in 1882. The abrupt change from the skeptical, wait-and-see attitude was dramatic and can clearly be seen in the medical publications of the years 1882 to 1885. The germ theory was now treated as something new and different, just as if it

[49] *Amer. J. Sci.,* 1875, 3d ser. *9,* 478; 1875, *10,* 402; 1877, *14,* 426; *The Sanitarian,* vols. 4-8, *passim,* 1880, *8,* 246; *Public health: reports and papers* 1873ff. An exception to this rule may be found in the *Rep. Nat. Bd. Health 1880,* Appendix H, 387-96.

[50] *Internat. Rev.,* 1880, *8,* 29-49. The lay magazines consulted included: *American Architect and Building News* (0 items); *American Journal of Science and the Arts* (5 items); *American Journal of Microscopy and Popular Science* (3 items); *American Monthly Microscopical Journal* (0); *American Naturalist* (2); *American Quarterly Microscopical Journal* (1); *Atlantic Monthly* (0); *Harper's Magazine* (1); *International Review* (1); *Journal of Social Science* (0); *Popular Science Monthly* (18); *Plumber and Sanitary Engineer* (1); *Scientific American* (without *Supplement*) (26).

had not been available to Americans for the past fifteen years! Furthermore, its acceptance was made with such little fanfare that one finds, for example, no mention of the germ theory in an 1881 article on a specific disease, whereas it is taken for granted in a similar article in 1885.[51]

After Koch's discovery, the medical profession as well as the medical editors accepted the germ theory with alacrity. The change in outlook is illustrated by a discussion which took place in 1882 at the Philadelphia County Medical Society following the presentation of a paper on the bacillus tuberculosis by Dr. H. F. Formad. Formad did not believe that the bacillus had any relation to the disease, in spite of Koch, but by this time the atmosphere was already hostile to those who *opposed* the germ theory, and Formad met rough treatment at the hands of his colleagues.[52]

Not many years after this, things began to get out of hand. Bacteriology became practically a scientific fad. Discoveries came thick and fast, and scientists soon were announcing bacterial causal factors for non-bacterial diseases, such as yellow fever, malaria, and, in veterinary medicine, hog cholera. The "remote" cause—the germs—became the sole factor in disease, and the "proximate" causes—the factors of predisposition, physical and mental condition, age, sex, etc.—were ignored. Fortunately, this fervor, which led early virus discoverers to doubt their own findings, did not cause the repudiation of the germ theory. By the late 1880's there were enough accurate findings available to enable the hypothesis to survive the mistakes of over-enthusiasm.

The sudden appearance of the germ explanation in articles on diseases in the medical publications of the mid-eighties is one of the more interesting mysteries of the whole American scene. One year there is scarcely a word about the theory in any of the journals, and the next year it is included as an accepted fact as if it had been known all along. The papers given before the medical societies offer the best clue as to how the abrupt acceptance took place. Evidently the etiological problem presented by the germ theory was argued out in these local groups and the results of the discussion were similar all over the country: the men who presented the arguments of Pasteur and Koch carried the day. Undoubtedly, the ranks

51 See, for example, *Phila. med. Times,* 1875-1885; *Trans. med. Soc. St. of Pa.,* vols. 12-15; *Trans. Coll. Phys. Phila.* 3d ser. vols. 4-6; *Trans. med. Soc. St. of N. Y.,* 1878-1886; *Trans. med. Soc. St. N. J.,* 1888; *Trans. N. H. med. Soc.,* 1883, etc.

52 Formad, H. F. The bacillus tuberculosis, and some anatomical points which suggest the refutation of its etiological relation with tuberculosis. *Proc. Phila. Co. med. Soc.,* 1882, 5, 29-41; Discussion, 41-42.

of the victors included the men who had studied abroad in recent years, particularly those who had had the opportunity to pursue bacteriological work in France and Germany.

Summary

The lack of interest in the germ theory on the part of the medical profession was a striking example of American neglect of research in basic science. Up to 1875 only one result of the theory was accepted in the United States: Lister's demonstration of the antiseptic system. His method was adopted because it worked, but the reasons behind it were rejected. This pragmatism in American outlook was matched by a strong intellectual conservatism. There was a tendency to be ultra-cautious when new theoretical concepts were introduced. The profession opposed innovation and change—it tended to be satisfied with the methods it had.[53]

In the post-Civil War period, however, laymen and scientists were much more receptive towards the new idea. Scientific magazines, especially the *Scientific American* and the *Popular Science Monthly,* brought up questions which were rarely discussed in the more erudite medical journals. Contributors to the popular science publications, moreover, included the leading scientists of the day, Europeans as well as Americans. It is not surprising to find that one must go to these publications and not to the professional ones for the new ideas, the new achievements, and the new frontiers in medical science.

The popular science magazines, of course, could afford to print more sensational articles because their editors faced a less critical audience. Editors may also have been influenced by the reputation of famous scientists, such as Tyndall, and so gave space to all their ideas, even those outside the writer's main field of research. In addition, the type of paper published in a popular journal could be more imaginative than one in a professional periodical because the authors were not risking their professional reputations in the process. It is also possible that physicians had more to *unlearn* than laymen, and the new doctrine was rejected because it did not conform with the accepted concepts of what disease was and how it spread.

53 Both, Carl. *Consumption and its treatment in all its forms.* Boston, 1873. Appendix, 151, 154. Both speaks at length about the difficulty of introducing new ideas into the United States. He blamed this on the lack of a national science foundation and on the fact that "in America nothing theoretical was wanted, but only that which was practical."

On the other hand, leading scientists may have used the popular journals as outlets for speculations they did not care to publish in learned journals. Some physicians, who published very cautious articles on the germ theory in professional medical periodicals gave a much more optimistic opinion of the same thing in the popular magazines.[54] It is entirely possible that these men were trying to goad the cautious physicians into seriously considering the new ideas. Whatever the motive, the net result was a series of competent, informative, and interesting papers in the popular science magazines. The way in which the germ theory was presented in these periodicals stands in marked contrast to the few references found to it in the professional medical journals of the same period.

Finally, after the general acceptance of the germ theory, things happened quick and fast. The general improvement in medical education, especially after the establishment of the Johns Hopkins Medical School, and the development of an increasingly scientific outlook in medicine helped America to catch up with Europe. With the great struggle to establish the germ theory over, Americans soon joined the forefront of the movement to increase knowledge in the sciences of bacteriology, virology, and immunology.

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54 Compare the article of L. A. Stimson: An experimental inquiry into the value of the carbolic acid spray as a preventive of putrefaction, *Amer. J. med. Sci.*, 1880, *79*, 83-89 with his Bacteria and their effects, *Pop. Sci. Mo.*, 1875, *6*, 399-405.

The Story of a Blood Transfusion to a Pope

G. A. LINDEBOOM*

THE increasing therapeutic use that modern medicine makes of blood transfusion intensifies the attention given to its history. Several important studies inform us about it. As a matter of course we want to know the very beginning of its development, in other words, when exactly the first transfusion from man to man took place. The blood transfusion given to Pope Innocent VIII is often referred to, be it only incidentally, as in a recent paper of Maluf.[1] The Pope died on 25 July 1492. Some days previously, as the story goes, a Jewish physician had infused the blood of three ten-year-old boys, who all died soon afterwards as a result of this. I endeavoured to find out where the story originated.

Pope Innocent VIII was born in 1432 and passed his youth at the Neapolitan court. In 1484 he ascended the Holy Chair. He did not live like a saint, and he seems to have had several children to whom he gave high positions within his sphere of influence. A sarcastic epigram mentions even eight sons and eight daughters, and turns his name from Innocent to Nocens, the very opposite:

> Octo nocens pueros genuit, totidemque puellas
> Hunc merito poterit dicere Roma patrem.

His main concern was with power and money. During his rule almost all of the Roman Curia were backsliding into simony and immorality. His health was poor during the last years of his life. In 1488 he suffered a stroke, and in 1490 his condition was temporarily so serious that he seemed almost dead.

It is not fair to dismiss the story of the blood transfusion for theoretical reasons as does Matthew[2] in a book on Innocent VIII's successor, Alexander VI (1492-1503). He rejects the story for two reasons: (i) the idea of blood transfusion could not enter the mind of any person not knowing about the circulation of the blood; (ii) the fact that the blood circulates was not published till 1628. A theoretical rejection like this is not tenable. As a matter of fact the idea had been mentioned long before Harvey's discovery. In 1566 Cardanus had already[3] alluded to it. He wrote that "there are some

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1 Maluf, N. S. R. History of blood transfusion. *J. Hist. Med.*, 1954, *9*, 59-107.

2 Matthew, A. *Life and times of Rodrigo Borgia.* London (n.d.).

3 *Vide:* Gurlt, *Geschichte der Chirurgie,* vol. II, p. 286.

who hope that they will manage to mix the blood of a decent youth with that from another by a double fistula (others with a single) (*Sunt qui cum alio iuveni bonorum morum duplica fistula, alii unica, commutare sanguinem posse sperent*).

The story of Pope Innocent VIII's blood transfusion appears in writings of some authors of the middle of last century. Oré[4] (1876) in a historic study on blood transfusion quotes a passage from the Italian author Villari[5] who published a book on the life of Hieronymus Savonarola (1859). The original passage of Villari reads:

Le forze vitali d'Innocenzo VIII svanivano rapidamente: egli era più tempo caduto in una specie di sopore, cresciuto qualche volta sino al punto di farlo creder morto a tutta la corte. Si cercava invano ogni mezzo per ridestare la spenta vitalità del papa, quando un medico ebreo propose di tentare con un nuovo strumento la transfusione del sangue; cosa tentata fino allora soltanto sugli animali. Il sangue del decrepito pontifice doveva passare tutto nelle vene d'un giovane, che doveva cedergli il suo. Tre volte fu tentata la difficile prova, nella quale, senza alcun giovamento del papa, tre giovanetti perderono successivamente la vita; forse a cagione di aria introdottasi nelle loro vene.

This is translated:

Innocent VIII was deteriorating rapidly; he had been in a sort of stupor for some time, even to such degree that all the court sometimes thought he had died. In vain they had tried anything to revive the exhausted energies. Then a Jewish physician proposed to try a blood transfusion by means of a new instrument, a thing that had hitherto never been tried except in animals. All the blood of the prostrate old man should pass into the veins of a youth who had to yield up his to the Pope. The difficult experiment was repeated three times, the result being that three boys lost their lives, without the Pope receiving any benefit of it, probably because air had penetrated into their veins.

Where did Villari get his story from? I traced it back to Gregorovius and Leo. Gregorovius[6] wrote in his *Geschichte der Stadt Rom* (1873):

Wenn das saubere Bild des verscheidenden Medici, welchen seinen Arzt durch einen Trank von aufgelösten Diamanten vergebens zu retten suchte, einer sinnvollen Fabel von dem Werte des Reichtums gleicht, mit welchen Namen soll man wohl die Scene benennen, die am Totenbette des Papstes gespielt haben soll? Sein jüdischer Leibarzt kam auf dem Gedanken, dem Sterbenden das Lebensblut von Knaben einzuflöszen; die zehnjährige Kinder gaben sich dazu um Geld her, und sie starben als Opfer dieses frevelvollen Experiments. Der Sterbende, so sagt man, gab seine Einwilligung dazu nicht; er stiesz den Arzt von sich.

[4] Oré, S. C. *Études historiques et physiologiques sur la transfusion du sang.* Paris, 1876.
[5] Villari. *La storia di Girolamo Savonarola.* Firenze, 1859, p. 140.
[6] Gregorovius, F. *Geschichte der Stadt Rom im Mittelalter,* vol. VII (3), p. 297.

And Leo[7] referred to the attempt of transfusion in a footnote in *Geschichte der Italienische Staaten*. Still, both Gregorovius and Leo, apart from mentioning the older writers Infessura and Raynaldus whom we shall discuss later, refer to Sismondi. Simonde de Sismondi[8] was a famous historian who wrote many volumes on the history of the Italian States in the Middle Ages. In the seventh volume, first published in 1809, a vivid description of the story can be found:

Dans sa dernière maladie, Innocent VIII se laissa persuader par un médecin juif de tenter le rémède de la transfusion de sang, souvent proposé par des charlatans, mais qu'on n'avait jusqu'alors jamais éprouvé que sur des animaux. Trois jeunes garçons, âgés de dix ans, furent successivement, moyennant une récompense donnée à leurs parents, soumis à l'appareil qui devait faire passer le sang de leurs veines dans celles du vieillard et le remplacer par le sien. Tous trois moururent dès le commencement de l'opération, probablement par l'introduction de quelque bulle d'air dans leurs veines, et le médecin juif prit la fuite plutôt que de s'essayer sur de nouvelles victimes.

Sismondi tells us (i) of an instrument by which the blood of the boys had to be conveyed into the old man, and his blood back into the boys' veins; and (ii) that the boys' death was probably due to air embolism (as Villari says also). Apparently it was Sismondi who introduced the story in its present version. It turns out that his vivid imagination framed unhistoric hypotheses.

The original data are to be found in the works of Infessura and Raynaldus. Stephanus Infessura wrote a diary on the city of Rome.[9] His German translator Hefele[10] regards him as a reliable author. Infessura wrote as follows:

Interea in urbe nunquam cessarunt tribulationes et mortes. Nam primo tres pueri decem annorum e venis quorum Judaeus quidem medicus, qui Papam sanum reddere promiserat, sanguinem extraxit, incontinenti mortui sunt. Dixerat namque illis Judaeus se velle sanare Pontificem, dummodo habere certam quantitatem sanguinis humani, et quidam juvenis, quem propterea extrahi jussit a tribus pueris, quibus post phlebotomiam unam ducatum pro quolibet donavit, et paulo post mortui sunt. Judaeus quidem fugit et Papa sanatus non est.

This could be translated as follows:

Meanwhile disasters and deaths did not cease in the city. For one thing, three ten-year-old boys died because blood had been taken from their veins

7 Leo, H. *Geschichte der Italienischen Staaten*. Hamburg, 1830, vol. IV, p. 618.

8 Simonde de Sismondi, J. C. L. *Histoire des républiques italiennes du moyen âge*. Paris, 1840, vol. VII, p. 289.

9 Infessura, Stephanus. *Diarium Romanum*, to be found in: Muratorius, L. A. *Rerum italicarum scriptores*. Mediol., 1723, vol. III, II, p. 1241.

10 Infessura, Stephanus. *Römisches Tagebuch*. Translated by Hermann Hefele. Jena, 1913.

by a Jewish physician in an attempt to cure the Pope, which he had promised to do. For the Jew said to them that he would cure the Pope provided he had a certain amount of human blood which had to be juvenile. Therefore he ordered it to be taken from the three boys, whom he gave a ducat each after the bloodletting. They died soon afterwards. The Jew fled, and the Pope was not cured.

Perusal of this passage reveals that Infessura's main intention was to describe the unrest in the town and its causes, as was the intention of the whole book. It is not the Pope's own doctor who is mentioned, but a Jewish physician. One gets the impression that a Jewish physician stayed incidentally in the city when the Pope's death was impending, and said he might save the Pope provided he had a youth's blood. Who ordered the bloodletting of the boys? In Hefele's translation the Pope did: "Worauf ihm dann der Papst befahl, dies Blut dreien Knaben heraus zu nehmen." But I do not believe that this translation is correct. The Jew is the subject of the sentence; if it were not so in the clause, it would have been indicated. One should remember that in those days a physician would not easily perform a bloodletting, this being surgeons' work. In my opinion this translation gives a biased picture of the Pope. For the rest, it should be noticed that Infessura does not tell what the Jew did with the blood. In the context the words "Papa non sanatus est" imply that it was given to the Pope in some form or other.

Now let us see what Raynaldus wrote about this story.[11] He said:

Laboraverat (Sc. Innocentius) diutino morbo, a biennio enim, quo torpore soporifero viginti horis sine vitae signis jacuerat, adversa valetudine fuerat usus: acciditque tum, ut cum vis morbi medicam artem eluderet, Judaeus impostor, qui valetudinem pollicebatur, a tribus pueris annorum decem, qui paulo post mortui sunt, sanguinem exhauserit, ut ex eo pharmacum stillatitium chemica arte paratum propinandum Pontifici conficeret; quod cum Innocentius rescevisset, execratus nefas, Judaeum iussit facessere, qui mox fuga supplicio se subduxit.

This could be translated like this:

He had been suffering from a protracted disease, that is, for two years, so that once he had been lying down unconscious, rigid, without any sign of life for twenty hours, his poor health wasting away; when the severity of the disease spurned all medical art it happened that a Jew, a deceiver who promised cure, tapped blood from three ten-year-old boys, who died soon after it, to compound a potion for the Pope by a chemical process. When Innocent heard of it he cursed this atrocity, and ordered the Jew to be punished, but the latter soon escaped the torture by flight.

11 Baronius, Caesar. Od. Raynaldus; Jac. Laderchius. *Annales ecclesiastici.* Paris, 1877, vol. 30, p. 186.

If this representation of the facts is correct, the incident need not have made so much stir in the immediate environment of the Pope, but much more so in the city where the rumour of the boys' death quickly spread. This would explain why some authors, who must have been well informed, are silent about it,[12] e.g. Burchardus,[13] who as a master of ceremonies was acquainted with all that was going on in the Vatican and who kept a diary, a sort of chronicle for private use, in which he recorded all that happened (for example, the orgies during Alexander VI's reign). Burchardus had no single motive for omitting the incident in his notes, but he does not mention it. The Florentine ambassador, too, who sent daily briefs about the Pope's condition to his city, does not mention it.[14] Nor does the ambassador of Mantua, according to the statement of Ludwig von Pastor in his *Geschichte der Päpste.*"[15]

So we may conclude that Sismondi has made up the story. It has survived in his version for more than a century. Indeed, consultation of the original sources proves that blood was taken from three boys (resulting in their death), but provides no ground to suppose that the blood was used for an attempted transfusion to the Pope.

12 For example, Raphaël de Volterra (or Volaterranus, who lived from 1451 to 1522) describes in volume XXII of his *Commentariorum urbanorum libri XXXVIII* the death of Innocentius VIII, without mentioning an attempt to lengthen the life of the Pope with the blood of boys.

13 Burchardus, J. *Diarium Innocentii VIII.* Edited by Thuasne. Paris, 1883.

14 *Ibid.*, vol. I, note 14.

15 Pastor, Ludwig, Freiherr von. *Geschichte der Päpste,* vol. III, 1, p. 281 note.

Notes and Queries

Edited by Ralph H. Major, M.D.* and Dorothy M. Schullian, Ph.D.**

Paris on Chemistry in Medicine

The status of chemistry in the curriculum of several American medical schools in the early decades of the nineteenth century has been examined in detail elsewhere.[1] One of the foremost problems was whether chemistry should be taught by a medical or non-medical man; this was the source of much contention particularly at the University of Pennsylvania. A further extension of the controversy was the question: Should the chair of chemistry really be a part of the medical faculty? Some went even to the extreme of advocating that it be deleted from a medical education completely. This enigma was due to a number of circumstances; the rapid development of chemistry following Lavoisier with the emergence of a new school of chemists without medical training (hitherto a primary source of chemical workers) and the bitter attack of the vitalists upon all chemistry were two major factors. There is little doubt that the dissension resulted in some quarters in a loss of prestige for chemistry as a part of medicine. Although this phenomenon appears to have arisen independently in America, there is some evidence that suggests a like depreciation of chemistry in Great Britain.

Chemistry was presented by non-physicians in European schools of medicine at an earlier date than in America, a fact that was accepted in most instances by the medical members of the faculty.[2] This was cited on several occasions by participants in the polemics cited above as an argument for a similar change in America. By 1825 in Great Britain, however, there must have been a tendency to minimize the importance of chemistry in medical education and practice; this is apparent from the prefatory commentary of John Ayrton Paris (1785-1856), a physician, in his book *The elements of medical chemistry; . . .* (London, 1825). Paris discusses the utility of chemistry to medicine in a unique 14-page preface entitled *A dialogue between the author, and a practitioner who is about to direct the medical studies of his son* (pp. 3-16). It is clear from Paris' remarks that the usefulness of chemistry was seriously questioned by some English physicians. An inability of the doctor to comprehend the advances in this science is

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1 H. S. Klickstein, *Library Chronicle* (University of Pennsylvania), 1950, *16*, 64-80; *Bull. Hist. Med.*, 1953, *27*, 43-68; *Chymia*, 1953, *4*, 129-157; *Bull. Hist. Med.*, 1954, *28*, 212-236.

2 Some disagreement existed, at the end of the eighteenth century, among the medical faculty of Upsala over chemistry and pharmacy according to Berzelius who had some difficulty in obtaining his degree in medicine as a result (O. Larsell, Tr., *Jöns Jacob Berzelius; autobiographical notes*, Baltimore, 1934, pp. 31-36).

offered as a reason by Paris to explain the situation. After a number of observations on medical education in general the following exchange takes place between the "Practitioner" and the "Author" (pp. 9-14); it is a rebuttal against the stand of the former.

PRACTITIONER

I thank you much for the sketch you have afforded me; I shall be guided by it, filling up the outline according to the circumstances and particular views which may present themselves. I am also, to speak candidly, not a little pleased to find that you have laid less stress upon the necessity of Chemistry, than I had anticipated.

AUTHOR

Mistake me not. I have certainly not assigned to it more importance than I conceived necessary; but you must distinctly understand that I consider no man capable of practising the profession of physic without a competent knowledge of it; and I am quite certain that, without its assistance, he can never discharge his duty to himself, or to his patient.

PRACTITIONER

I have now been settled as a medical practitioner for upwards of five and twenty years; and I need scarcely observe that in my younger days Chemistry was scarcely regarded as a branch of medical study; my knowledge on this subject is necessarily, therefore, extremely imperfect; but I feel no hesitation in declaring, that in no single instance do I remember ever having felt an embarrassment at the bed side, or in the Surgery, from my deficiency; and I am strongly inclined to regard it rather in the light of an accomplishment, than in that of a necessary and indispensable qualification.

AUTHOR

Your argument, if such it can be called, amounts to no more than this,—that you have never felt the want of that which you never knew.

PRACTITIONER

If I have never known the advantages of Chemistry, I have, at least, experienced some of its evils; and I think you will admit, notwithstanding all your prejudices in its favour, that the Physiologist can have but few obligations to it; recollect only some of the numerous fallacies which have arisen from chemical theories.

AUTHOR

If it be philosophical to argue against the utility of an instrument from a few instances of its abuse, I must certainly leave you in the undisturbed enjoyment of your assumed triumph; but remember the exclamation of Friar Lawrence—*"Virtue itself turns Vice, being misapplied."*

PRACTITIONER

You acknowledge then the extent of the evils which have flowed from your favorite science.

AUTHOR

Most cheerfully. Nay, I go farther, I triumph in them. Pope has somewhere said that when a man owns himself to have been in error, he does but tell you that he is wiser than he was; and you must admit that it would

be truly discouraging, if the Physiologist of the present day, with all the advantages of modern discovery, were unable to detect the errors of his predecessors.

PRACTITIONER

You will scarcely venture to assert that the living power is not constantly opposed to chemical action.

AUTHOR

And, for that reason, it is essential to learn the nature of chemical action, before we can attempt to appreciate the extent of that force which modifies or resists it. But there are changes perpetually going on in the animal body that are beyond the control of the living principle, and therefore the Physiologist, who is not a Chemist, will be utterly at a loss to comprehend them.

PRACTITIONER

He will thus, at least, avoid error; and escape the danger of those false lights, which, like Will o' the Whisps, have ever led astray those who have pursued them.

AUTHOR

Chemistry alone can enable you to avoid such false lights; the benighted traveller will best defeat the treachery of the Will o' the Whisp by carrying a lamp in his own hand.

PRACTITIONER

And you are now endeavoring to seduce me from the safe path by the false glare of an allegory.

AUTHOR

I will at once refute that charge by a plain practical illustration. I need not remind you that, for many years, the cause of all calculous disorders was referred to the impurities of water. This idea so far from being the suggestion of chemical theory, arose, I believe, entirely from the occurence of certain sediments observed in water, and supposed to resemble, in appearance, the calculi found in the human subject; and had not the Chemist refuted the error, the prejudice might still have continued, and the crust of the tea kettle have remained a source of perpetual terror. Is this no obligation conferred by Chemistry upon medicine?

PRACTITIONER

I admit it. The fact is striking, and never occurred to me before.

AUTHOR

Let us examine the subject a little farther. You must well know that old persons are extremely liable to be affected with calculous accumulations in the prostate gland. The Chemist examined their composition, and found them to consist of phosphate of lime combined with ammonia; by reasoning upon this fact, he was led to conclude that the matter was derived from the spontaneous decomposition of urine, which by yielding ammonia precipitated the phosphoric salt, and thus formed the concretion in question. The practice suggested by this discovery is obvious; to empty the bladder at intervals, and prevent the decomposition of urine in its cavity. The experiment succeeds, and much human misery has been prevented. Is this no obligation conferred upon Medicine by Chemistry?

PRACTITIONER

I confess myself a convert upon these points; but I have another charge to bring against Chemistry, which, I fancy, you will not so easily refute. It has enabled the manufacturer to adulterate our drugs with greater art.

AUTHOR

Then become a Chemist, and you will be enabled, by very simple means, to detect the fraud; in this case, Chemistry, like the spear of Telephus, carries upon its surface a balm for every wound it may inflict. Once for all, my good friend, I advise you to cease your hostilities; for like the Philistines of old your forges serve no other purpose than to sharpen the defensive weapons of your adversaries.

PRACTITIONER

I am content. I feel the great importance of the science from the few striking arguments you have used, and I am anxious to impress the same feeling upon my son.

AUTHOR

Before I quit the subject, I would say a few words regarding the impolicy of neglecting the study of Chemistry in the present enlightened age. This science, which during the last ten years has scarcely been known beyond the precincts of a small group of philosophers, is rapidly extending itself through all ranks of the community; the higher classes of society are crowding to the lecture rooms of our public institutions, and the mechanic and artisan are becoming enlightened through the medium of chemical societies, and the extensive circulation of cheap publications. What would be the surprise of our fathers, could their spirits revisit us, to see a sectarian meeting house crowded to excess with mechanics, to hear a chemical lecture from the reading desk! In such a state of intellectual advancement, what will become of the medical practitioner, unless he keeps pace with the general progress? It is obvious that he must lose his place in the scale of society, and the credit and respectability of the profession must sink. The mere mechanic will be the better man, and he will look down with contempt upon the physician or apothecary, who being ignorant in Chemistry, must, as his reading will have informed him, be ignorant in the most essential parts of his advocation.

PRACTITIONER

Patients trouble themselves no more about the science of their doctors, than we do about the mathematical acquirements of our carpenters.

AUTHOR

There is no analogy in the cases. The mechanic merely follows, by routine, the same work which has been performed by hundreds before him; but the Physician, in every particular case, has a new problem to solve, for which he has to exert his reason, and to invent expedients for each exigency. He is not therefore to be compared to the working mechanic, but to the inventor of new machinery, and you will admit, I trust, that science is of some use to the Engineer.

PRACTITIONER

It is unnecessary to carry your arguments any farther, I have already confessed myself your convert, and am now anxiously waiting to learn the plan on which my son ought to commence the study.

The dialogue concludes with an outline of how to study chemistry which stresses the importance of laboratory work. It is of interest to note that Paris' work was reprinted in New York (1825) and translated into French (Paris, 1826).

HERBERT S. KLICKSTEIN

Osler's Catalogue

Plus oblige et peut davantage
Un beau visage
Qu'un homme armé

And there were two of them who "ganged up" on me, one saying something must be written about the anniversary while the other, producing a long forgotten correspondence file of puffs about the Osler catalogue, told me it was high time I blew my own horn for once.

It is twenty-five years since the Osler Library was formally opened at McGill on 29 May 1929, the hottest day in the memory of the participants, particularly those functioning in academicals. A less strenuous occurrence was the receipt a few weeks earlier of the first copy of its printed catalogue, a ponderous quarto of some 800 pages and entitled, "Bibliotheca Osleriana, a catalogue of books illustrating the history of medicine and science collected, arranged, and annotated by Sir William Osler, and bequeathed to McGill University. Oxford: at the Clarendon Press, 1929." That imprint is a compliment, being granted by the Oxford Press only to "scholarly" productions. Planned and begun by Osler, the work is basically and essentially his, so it is not my horn I am blowing when I maintain that this has become a famous reference book which will perpetuate Osler's name; for as he said of Billings, "There is no better float through posterity than to be the author of a good bibliography." My part was that of chief editor, one among several successive collaborators. We learned more than the technicalities of our job from one of them, Mr. R. H. Hill, then of the Bodleian and now director of the National Central Library in London; another was Archibald Malloch whose death last year is so widely deplored. When deafness threatened his promising clinical career at Montreal, he became the distinguished librarian of the New York Academy of Medicine. An anonymous fourth was an old friend from my 'teens on, that quaint and erudite wizard, L. L. Mackall, whom Garrison called Osler's bibliographic sleuth-hound—he seemed to know the whereabouts, history, and prospects of any and every rare book. Dear old Leonard! Some of us have difficulty deciphering our own script, but you always carried a typewriter and could even make that illegible!

Seven hundred and fifty copies of the "Bibliotheca" were printed of which more than 150 were distributed gratis. It has been out of print for some years and recently one of the recipient libraries had to pay $75 for a second-hand replacement copy. It sold at 3 guineas originally ($19 in

Canada, $21 in the U. S., thanks to our barbaric Customs). It and I have been credited with more accuracy than a glance into our interleaved copy can justify. With that in view we took our time, and (after spontaneous pleas by Harvey Cushing) both Lady Osler, who financed the work, and McGill, where the magnificent room was ready long before the books arrived, were mercifully patient. Osler once wrote, in recommending me for another editorial job, "His meticulosity exceeds anything you ever met with." That may not be a compliment, but he always had me read his manuscripts and proofs if I was accessible. A printed catalogue has advantages, especially for a more or less fixed collection, but it needs to be reliable. I have seen a wonderful library caricatured by a neatly multigraphed and well-bound catalogue (happily suppressed). It was compiled in secret haste by a devotee who could neither spell nor copy even her own language. "Well, I had to get it ready for Doctor's birthday!" I doubt if "Doctor" ever had a more embarrassing surprise. Being sensitive about that alleged "meticulosity," I was glad to get even with a learned friend who sent me a copy of his book inscribed to me "in fear and trembling of (my) deadly accuracy." I had to read nearly 60 pages before finding a mere slip, but for him a horrible howler, George Washington inaugurated in 1801.

Osler could entertain a mixed company with comments on a bookseller's catalogue, though I doubt if he quite agreed with Sylvestre Bonnard that there is no reading more easy, more fascinating, more delightful. However, in a recent and useful medico-bibliographical work the readability of our "Bib. Osl."—the soap advertisements render the use of the simple initials "objectionable"—is mentioned three times with ever-increasing approval. The introduction, by a really consummate scholar, classifies it as a "partially readable" history of medicine, no less, and in the text the author calls it "probably" and 17 pages later "surely the most readable catalogue ever compiled." After that I don't need to bother you with those 1929 puffs!

W. W. Francis

Vincenzo Chiarugi (1759-1820)—Pioneer in Psychiatric Reform

The attention of our readers is directed to a most scholarly and well-documented paper by Dr. George Mora which recently appeared in the *Bulletin of the Isaac Ray Medical Library,* Butler Hospital, Providence, Rhode Island under the title of "Vincenzo Chiarugi (1759-1820)—His Contribution to Psychiatry" (1954, 2, 51-104). It is customary to look upon William Tuke (1827-1895) and Philippe Pinel (1745-1826) of the Bicêtre as the great reformers in the treatment of the insane, whereas the contributions of Vincenzo Chiarugi, a near contemporary of both Tuke and Pinel, have been largely overlooked. Born near Florence, Chiarugi graduated with great distinction in medicine from the University of Pisa in 1780 shortly after which he was appointed resident physician at the Hospital of Santa Maria Novella in Florence. He became a protegé of the Grand Duke

Leopoldo I who, in 1785, made him responsible for planning a new mental hospital, S. Bonifacio, which was opened in March, 1788. Here Chiarugi assumed a heavy burden of teaching responsibility, but he devoted his chief attention to the insane. He died in 1820 following a period of overwork created by the typhus epidemic of 1817 during which he had been placed by the government of Florence in charge of public health measures.

The book upon which his reputation largely rests appeared at Florence in 1793-94 in three volumes under the title, *Della pazzia in genere e in specie, trattato medico analitico con una centuria di osservazioni.* A second edition was issued in 1808, and a German translation was published at Leipzig in 1795. Dr. Mora used the copy in the Armed Forces Medical Library.

It is clear from the passages cited by Dr. Mora that Chiarugi was first of all a very keen clinical observer whose accounts of a given patient's symptoms were always set down in the most accurate detail. To some extent, he was influenced by the crude concepts of mental disease current in his time, but in treating his patients he was above all humane, avoiding physical restraint in any form, and he was also a strong advocate of the value of occupational therapy. He was familiar with the manic depressive syndrome of modern parlance, and appreciated the fact that a cyclic course could be anticipated in the majority of such patients. Unfortunately, Chiarugi did not train an understudy, and when he died his teachings were soon forgotten—forgotten for almost one hundred years when they were revived by his countryman, Alberto Vedrani (*Gli scienzati italiani dall'inizio del medio evo ai nostri giorni.* Rome, 1923, *1*, 40-44). One of the reasons for Chiarugi's oblivion was the uncharitable attitude of the influential Philippe Pinel toward his work, and unfortunately many others uncritically followed Pinel's judgment.

Medical historians will feel a particular debt of gratitude to Dr. Mora for this fine appreciation of a man whose life and work should be much more widely known.

J. F. F.

Australian Academy of Science

Professor John C. Eccles, F.R.S., who occupies the Chair of Physiology at the Australian National University in Canberra, writes:

On February 16 this year the Queen founded the Australian Academy of Science here in Canberra at a ceremony attended only by the Duke, the Governor-General, and eight of us who are members of the first council. We believe this to be the second occasion on which a reigning British monarch has personally founded a scientific academy, the first being in 1662! The Queen seemed much interested when she was informed of this after the event. The Academy has prospered and now we have in all 64 Fellows in Australia, including all of the 19 Fellows of the Royal Society that are resi-

dent here. All we can hope is that it will in time become a worthy offspring of the Royal Society, for the Royal Society of London helped us greatly in securing the Royal Charter. The offices of the Academy will be here in Canberra. Here, in fact, twelve of the Fellows live, so you can see that in this town of about 30,000 people we have quite a scientific nucleus rivalling even Melbourne and Sydney.

Theodoric, Master Surgeon of the Thirteenth Century

Neurosurgeon and classical scholar, Dr. Eldridge Campbell of the Department of Neurosurgery at Albany Hospital has recently published in the *New York State Journal of Medicine* (1954, *54*, 191-194) an important paper on the thirteenth century surgeon, Theodoric. "The objectives of the surgeon's operation," Theodoric wrote, "are three: The joining together of broken parts, the separation of parts unnaturally joined, and the removal of whatever is superfluous." He united lacerated intestines by the use of the finest needle and by the use of delicate thread made from the intestines of animals, or, if this could not be had, by the use of fine silk, the laceration to be repaired "after the intestines have first been washed with hot, dark wine." He adds, "When they [the intestines] have been well cleansed, let them be put back clean and dry, and . . . let the wound be sewed up." With fractures of the head or limbs he practised *débridement* ["abradantur"], and using a dressing soaked in warm wine, he sewed up his wounds tightly, deploring the Galenic teaching still widely held that pus was "laudable." Dr. Campbell feels that had Theodoric been heeded, the great advances of surgery might have taken place some five hundred years before they actually did. He then cites a modern instance in which prejudice prevented acceptance of an important new development in neurosurgery, namely, ventriculography, when the originator of the procedure was refused a place on the program of a national neurological society.

J. F. F.

On the Transmission of Louse-borne Typhus

In his Boylston Prize Essay for 1860, Dr. David W. Cheever of Boston cautioned his contemporaries against excessive devotion to statistics, and in view of the statistical naïveté of some followers of the "numerical method," his remarks were well taken. "Nor can numbers," he warned, "any more than our senses, teach us anything by themselves." It now appears that Cheever also demonstrated unconsciously the dangers of offhand comparisons. Some men, he wrote, "by computations, bring the motion of the earth about its axis and around the sun, into a certain relation with the weight and excretory processes of the human body, thus pretending to establish a tidal flow of our excretions, ruled over by remote planets. . . . It could be no more ridiculous for the stranger who passed the night in the steerage of an emigrant ship to ascribe the typhus, which he

there contracted, to the vermin with which the bodies of the sick might be infested."[1]

JOHN B. BLAKE

Archibald Menzies, Ship's Surgeon

In the annual Osler Lecture delivered to the Vancouver Medical Association on 2 March 1954, the eminent Canadian neurosurgeon, Dr. Frank Turnbull, in a most illuminating historical paper entitled, "Vancouver and Menzies, or, Medicine on the Quarter-Deck," published in the *Bulletin of the Vancouver Medical Association* for April, 1954, described the seven-year voyage of the ship *Discovery* which had been commissioned to carry out a scientific expedition for a study of the South Seas and the northwest coast of America, and especially to investigate the English fur-trading center of Nootka which the Spanish were attempting to seize. The commanding officer appointed by the Royal Navy was George Vancouver for whom the Canadian settlement in British Columbia was ultimately named. The expedition set off on 1 April 1791 and after rounding the Cape of Good Hope they explored the south coast of Australia and New Zealand, sailing thence to the Sandwich Islands (Hawaii) before proceeding to Nootka.

Dr. Archibald Menzies, physician and botanist, was the chief scientist of the expedition but, unfortunately, his collecting activities brought him from time to time into conflict with Vancouver. He, however, treated his captain with respect and all went well until the return voyage when Vancouver, by that time in failing health, became irritated with his ship's surgeon because of his greenhouse, situated on the quarter-deck, in which seedlings of many rare and valuable plants were being diligently nurtured and watered when fresh water was at a premium. Vancouver briskly ordered Menzies' sailor-assistant to duty that prevented him from tending the greenhouse and finally, when Menzies strong objected to this command, he was informed that he, Menzies, would face court-martial for insolence and contempt as soon as they reached England. He eventually apologized, however, and the court-martial proceedings were abandoned, but Dr. Turnbull does not tell us what finally happened to Menzies' seedlings!

J. F. F.

Fourteenth George Dock Lecture

The Fourteenth George Dock Lecture presented by the Barlow Society for the History of Medicine was held in the Library of the Los Angeles County Medical Association on 10 June 1954. The lecturer, Dr. Richard C. Rudolph, Professor of Oriental Languages at the University of California at Los Angeles, chose as his subject "The Japanese Dutch Interpreters Overthrow the Chinese Galen." In connection with the lecture an exhibit of Chinese and Japanese items of medical interest was arranged. Dr. Edgar F. Mauer is Acting President of the Barlow Society.

[1] "The value and the fallacy of statistics in the observation of disease," *Boston med. surg. J.*, 1860-61, *63*, 450.

First Child Born Under Chloroform

It is a sad commentary on medical history that too often historians are content to accept without verification assertions that have been made by earlier writers. This undoubtedly results in the perpetuation of errors, to which more importance is naturally attached when these emanate from reliable authorities.

One such instance is the more or less generally believed pronouncement that the first baby to be born under the influence of chloroform was christened *Anæsthesia*. The actual circumstances can be briefly summarised.

William Carstairs, M.D., on his retiral from the Indian Civil Service, resided (and died), not in Edinburgh, as has been stated, but at Ferry Bank, Cupar-Fife. (Incidentally, his father, James Carstairs, and his brother, also James Carstairs, successively held the office of Town-Clerk there.) Dr. William Carstairs's third wife was Jane Meldrum of Craigfoodie, also in Fife. A daughter was born to them, on 9 November 1847, at 19 Albany Street, Edinburgh. She was the first child to be delivered under chloroform by Dr. James Young Simpson (created a baronet, 1866). At Cupar-Fife, on 25 December 1847, she was christened *Wilhelmina*, not *Anæsthesia*.

It may, however, prove interesting to explain why fiction masqueraded as fact. Dr. Simpson continued on friendly terms with the Carstairs family. On seeing a photograph of Wilhelmina Carstairs, when she was seventeen years of age, he exclaimed "Saint Anæsthesia," because of her prayer-like pose.

The writer has been privileged to have this irrefutable evidence brought to his notice, both verbally and in writing, by the son (still living) of the first child born under chloroform; she married in 1868 and died in 1910.

J. Menzies Campbell

Pharmacy at University College Hospital

The University of London was founded in 1827, the cornerstone having been laid by the Duke of Sussex on 30 April 1827, and courses of lectures in art, law, and medicine were first offered in October-November, 1828. No religious training was offered, and the early students in consequence came to be known as "the heathens of Gower Street" and their ideas of medical education were so advanced that they were later referred to with a slightly derisive air as "the Gospel according to Gower Street."

To provide clinical facilities the University College Hospital was established in 1833 and on this occasion the ceremonies were presided over by the Duke of Somerset (20 May 1833). The Hospital was opened on 1 November of that year. Although new as London hospitals go, its history has been a distinguished one. In addition to its Dispensary and the early teachings in the field of pharmacy, it has acquired fame through an event of prime importance in the annals of the Hospital—the first operation to

be conducted under a volatile anesthetic in England. It was carried out on 21 December 1846 by the eminent surgeon, Robert Liston. Peter Squire and his brother, William, two pharmacists, administered the anesthetic to Liston's patient; present also at the operation was a young house surgeon named Joseph Lister. The patient survived the amputation, having felt no pain, and the procedure proved to be eminently successful. The original protocol of the celebrated operation is given for the first time in T. D. Whittet's "A History of Pharmacy at University College Hospital," reprinted from *The Chemist and Druggist* (1953, 6, 13, 20 June and 4, 11 July, 16 pp.).

An Error Corrected

Dr. Leonard Tushnet of Maplewood, New Jersey has called to our attention an error in "American Doctors in the Crimean War" published in Notes and Queries in the July issue (1954, *9*, 362-367). He writes:

"The Dr. Gewson referred to (near the bottom of page 364) is Dr. Hewson. Because of the absence of a letter for the sound of 'H' in the Cyrillic alphabet, Russian writers substitute the letter Г, pronounced as our 'G' in 'gate.'

"Dr. Addinell Hewson (1828-1889) was Lecturer in Surgery in 1855, and for several succeeding years in the summer school of Jefferson Medical College. He was a prominent and original-thinking surgeon in Philadelphia, being one of the first to adopt the principles of antisepsis. A short biography of him appears in the 'History of the Pennsylvania Hospital, 1751-1891' by Morton and Woodbury, as well as a memoir in the *Annals of Surgery*, vol. 25, 1934."

Section on Medical History—Philadelphia

The Section on Medical History of the College of Physicians of Philadelphia is giving a course on medical history to the students of the medical colleges of the city. The 1954 program is as follows:

18 October —Introductory: The Meaning and Values of Medical History
—Dr. Richard H. Shryock
25 October —Classical Medicine—Dr. Owsei Temkin
1 November—Renaissance Medicine—Dr. Temkin
8 November—Seventeenth and Eighteenth Century Medicine—Dr. Temkin
15 November—Nineteenth and Twentieth Century Medicine—Dr. Shryock
22 November—Social Aspects of Medical History—Dr. Shryock

Book Reviews

MARCEL FLORKIN. *Médecine et médecins au Pays de Liège.* (Université de Liège, Travaux du Séminaire d'Histoire de la Médecine, Volume 1). Liège, H. Vaillant-Carmanne, 1954. 231 pp., illus.

Reviewed by GEORGE SARTON, *Professor Emeritus of the History of Science, Harvard University.*

WE owe thanks to Dr. Florkin, Professor at the University of Liège, for a volume devoted to what the French call "la petite histoire" of his beloved country. It is not only entertaining but also very instructive. A good part of it describes the lives and achievements of local physicians of the eighteenth and nineteenth centuries, such as the brothers Grandjean, eye-doctors to the king of France, Josef von Sartori, Jean-Paul Bovy, the Ansiaux medical dynasty. Another famous family was that of the Limbourg (alias Limburgius, Limborch). I do not know whether the Liégeois members of that family were related to the most famous bearer of the name, the illustrious Dutch Remonstrant, Philippus à Limborch (1633-1712), author of the *Historia Inquisitionis* (Amsterdam, 1692).[1] Many of these biographies are of little interest except to Liégeois, but two parts of Dr. Florkin's book deserve to arrest the attention of every historian of medicine; the first deals with Spa and the second with Nysten.

1. *Spa.* It has often been said that the history of mineral springs begins with the Romans, who attached great importance to them, and Sigerist once remarked that the comparative neglect of American springs was probably due to the fact that America had never been colonized by the Romans! It is clear now that the value of thermal or mineral springs was already recognized in prehistoric times.[2] The fact remains that the Romans exploited springs as had never been done before. The Latin names of many European cities begin with Aquae, which implies that the city grew around a mineral spring, e.g., Aquae Spadanae (Spa), Aquae Bigerronum (Bagnéres), Aquae Lupiae (Guadalupe), etc. The word Aquae often became in German or French Aachen or Aix (Aix la Chapelle, Aix les Bains, Aix en Provence, etc.). The names of other French places begin with Eaux, Eaux-Bonnes, Eaux-Chaudes, etc., the implication being the same.

During the Middle Ages and the Renaissance the interest in baths and springs declined considerably, but it was revived at the end of the seventeenth century, and the Aquae Spadanae, east of Liège, was one of the spearheads of that revival. The fame of Spa was so great that the proper name of

1 Sarton, George. *Introduction to the history of Science.* Baltimore, Williams and Wilkins Company, 1927-47. 3 vols. (*3*, 404). *Nieuw Nederlandsch biografisch woordenbock* (Leiden), 1933, *9*, 608-11.

2 *Introduction* (*3*, 287).

the city became a common name used to designate any mineral spring. Instead of saying Aquae, Aachen, Aix or Eaux, one said "Spa."

What were the causes of that popularity? One of the main causes was philosophical or scientific. During the seventeenth century controversies had raged between the iatrochemists and the iatrophysicists; those controversies were naturally futile, because the former did not know enough chemistry, while the latter were short in physics. Now, by the end of the century, the Cartesian philosophy was being gradually superseded by the Leibnizian, which was more dynamic. New medical doctrines were taught at Halle by Friedrich Hoffmann (1660-1742), who was influenced by Robert Boyle as well as by Leibniz. He created what might be called iatromechanics, insisting on the importance of motion in and outside the body. These views were applied to the chalybeate waters of Spa by a local physician, Noël-Théodore Le Drou (1699-1752), who wrote various treatises explaining the virtues of the Spa waters. Strangely enough, the latter did not owe their success so much to their mineral contents (iron, sulphur, etc.) but to the fact that they were highly sparkling and crackling. Such waters, it was fondly believed, would bring motion into the body and tonify it. According to Dr. Le Drou, there was no remedy in nature as efficacious as the Spa waters, none which would cure so great a diversity of diseases. The Spa cure consisted in drinking many glasses of water every day, considerable walking from one spring to the others, dancing, and taking as much exercise as possible. The waters would introduce motion and tonus inside, the exercises would reinforce their action from the outside.

The theory was fortified by the philosophy of Leibniz[3] and it received the approval of Dr. Boerhaave; moreover, were the sparkliness and the ticklishness of the waters not obvious to every patient? Success increased throughout the eighteenth century until Lavoisier showed the cause of the sparkliness, took the magic out of the waters, and reduced them to a solution of carbonate of iron and other salts with an excess of carbonic anhydride.

In the meanwhile, before Lavoisier's debunking, the popularity of Spa was boosted by commercial exploitation and snobbishness. It had attracted people of the nobility for a long time. One of the pioneers was Peter the Great during his Western travels (1696-1697). It is said that when he visited Spa, his luncheon consisted of twenty glasses of mineral waters, twelve figs, and six pounds of cherries. Sixty or seventy years later, Spa reached its social climax. It was visited by the Emperor Joseph II and the Prince de Ligne. The latter was annoyed because the resort was not sufficiently exclusive and he contemplated its amusements with a jaundiced eye. Many princes and noblemen went to Spa with their families, but there were also a number of rich people, "nouveaux riches" or would-be rich, plus adventurers, quacks, and crooks of both sexes and many sorts. That could not be helped. A

[3] The influence of Leibniz' philosophy upon eighteenth century science has been underlined by me apropos of the Genevese naturalist, Charles Bonnet (1720-93), in *Isis* (1952, *43*, 277-280).

fashionable place is bound to attract the worst customers as well as the best, the canaille as well as the élite. As it was necessary to amuse the crowd, balls and theatrical performances had to be provided. One Simon de Harlez, whom Dr. Florkin calls with pardonable exaggeration, "le Molière des Eaux de Spa" wrote comedies in the Walloon dialect, e.g., "Les Ypoconte,[4] Opera burless . . . Mettou ès musik par Mr. Hamal" (Liège 1758). Simon de Harlez was a lord and canon, member of the Privy Council, etc.; the composer, Jean-Noël Hamal (1709-78), choir master of the Liège cathedral, was a protégé of Grétry. But there is no end to the medical and social history of Spa, and we must stop.

2. *Nysten.* Pierre Hubert Nysten (Liège, 1771-Paris 1818) was a disciple of Bichat and became professor at the Ecole de Santé of Paris and "médecin des hôpitaux." He had distinguished himself in 1803 with his *Nouvelles expériences galvaniques* and devoted himself mainly to studies in chemistry and materia medica. In 1811, he published his masterpiece, *Recherches de physiologie et de chimie pathologiques pour faire suite à celles de Bichat sur la vie et la mort.* His fame, however, is based upon the writing of a great medical dictionary, the history of which is very curious.

The bookseller, J. A. Brosson, published in 1806, a medical dictionary, edited by the ex-Oratorian, Joseph Capuron (1767-1850), the *Nouveau dictionnaire de médecine, de chirurgie, de physique, de chimie et d'histoire naturelle* (note the title). The second edition was revised by Chaudé and Nysten (Paris 1810). The third was published by Nysten alone in 1814, obtained a considerable success, and it was then that medical students began to speak of "le Nysten," just as they would say "le Larousse." According to Littré, Capuron was "un ancien oratorien resté philosophe, quoique devenu accoucheur." Nysten, on the other hand, was a disciple of Bichat and a chemist. A comparison of the dictionaries of 1806 and 1814 shows tremendous differences. The tenth edition, published by Baillière (Paris 1855) still bore Nysten's name (though Nysten had died in 1818), because that name had become a valuable trademark, but the work had been completely overhauled and transformed by the new editors, Emile Littré and Charles Robin, disciples of Auguste Comte. When the twelfth edition appeared in 1866, prepared by the same editors, Nysten's widow sued the publisher, claiming property of the *Dictionnaire*, damages, and the cancellation of her husband's name from the title-page. She won her case, but more troubles followed. The thirteenth edition (1873) and the fourteenth (1878) bore only the names of Littré and Robin, the fifteenth (1884) Littré's name only, but it included sweetenings which must have caused the latter to turn in his grave (he had died in 1881). The eliminated Robin was still alive, and he prepared for the publisher Doin, a *Nouveau dictionnaire abrégé de médecine* (2 vols., 1885), wherein he hoped that "the scientific and purely philosophical spirit of the old Nysten" would be revived. The first volume

[4] Ypoconte, Walloon for hypochondriac.

appeared in February, the second in December. Robin died in between. The other dictionary, the sweetened one, continued to appear under Littré's name. As Sainte Beuve wrote in his *Lundis,* "One has never talked more of Nysten than since his name has been used as a stone to lapidate Mr. Littré."

In short, the "Nysten" was a medical dictionary that lasted almost a century, bore the names of other editors, changed its contents repeatedly and its philosophy at least twice. It was always the same old Nysten, but some editions were as different from each other as were the successive generations of students who swore by them.

Florkin's book is offered as the first of a new series. It is a good beginning. I hope many more volumes of this kind will be written or edited by Dr. Florkin. He is a Liégeois writing for other Liégeois and taking the Pays de Liège too much for granted. It would be well if some of the following books would explain that country for the sake of the scholars who had the misfortune of being born elsewhere.

The Pays de Liège, being now a part of Belgium, has lost its identity and foreigners forget its history, if they have ever known it. It was centered around a bishopric, the see of which was first in Tongres (313-558), then in Maestricht (to 680), finally in Liège. It became a feoff of the Holy Roman Empire and many of the prince-bishops were Germans. German influences were strong as is proved by the language (the Walloon dialect contains a good many words of Germanic origin),[5] by the arts,[6] and by the development of mining and metallurgy.[7] In spite of all those Germanic influences, the Pays de Liège has always been remarkably Francophile and the people of that province speak the purest French in Belgium as well as their savoury Walloon dialect. The principality ceased to exist at the time of the French Revolution; it was incorporated into the Netherlands in 1814, and became a part of Belgium in 1830.

The early heroes of the Pays de Liège were saints, like Lambert of Tongres (d. 709) and Hubert of Tongres (d. 727), patron of hunters. Later, the Germanic culture of St. Gall was moved to Liège; for example, the illustrious Notger (X-2) was dean of St. Gall before being raised to the bishopric of Liège. Under his direction, Liège became the main intellectual center of the Empire, and his disciples spread all over Western Europe. Think also of Radolf of Liège (IX-1), Franco (XI-2), and later Jacques de Hemricourt (XIV-2).[8]

Let us hope that Dr. Florkin will be able to persuade some of his colleagues, mediaevalists and historians, to devote a book of his series, or more

[5] Warland, J. *Glossar und Grammatik der germanischen Lehnwörter in der wallonischen Mundart Malmédys* (Liège, 1940, 338 pp.). Geschiere, Lein. *Elements néerlandais du wallon liègeois* (Amsterdam, 1950, 400 pp.).

[6] E.g., the copper work called dinanderie. A fine specimen is the font of St. Bartholomew in Liège by Renier of Huy (beg. of the twelfth century). A cast of it can be seen in the Germanic Museum of Harvard University. See my *Introduction* (*3*, 727, 1125, 1561).

[7] *Introduction* (*3*, 221, 1173). Henri Pirenne has claimed that in such matters the Liégeois influenced the Germans, rather than the opposite. Be that as it may, relationships between the Liège bishopric and Germany were continuous.

[8] For more information on these men, see my *Introduction* (*1*, 657, 715, 757; *3*, 1750).

than one, to the scientific glories of the Pays de Liège from the seventh century on. An excellent example was given on the mathematical side by the late Constantin Le Paige (1852-1929) in his "Notes pour servir à l'étude des mathématiques dans l'ancien Pays de Liège" (*Bull. de l'Institut archéologique liégeois 1888, 21,* 457-565).[9] There is an abundance of materials for the medical side,[10] for there were always more physicians than mathematicians. All that is needed is to put those materials together and revive the glory of the ancient bishopric. Dr. Florkin's book is admirably illustrated and well indexed.

LUIGI GALVANI. *Commentary on the Effects of Electricity on Muscular Motion.* Translated into English by Margaret Glover Foley with Notes and a Critical Introduction by I. Bernard Cohen. Together with a Facsimile of Galvani's *De Viribus Electricitatis in Motu Musculari Commentarius* (1791) and a Bibliography of the Editions and Translations of Galvani's Book prepared by John Farquhar Fulton and Madeline E. Stanton. Norwalk, Connecticut, Burndy Library, 1953. (Burndy Library Publication No. 10) 176 pp., illus. $6.00.

Reviewed by CHARLES DONALD O'MALLEY, *Professor of History, Stanford University, California.*

THE present work was originally planned for appearance in 1941 as a sesquicentennial edition of Galvani's *Commentary,* but, as with so many other things, the onset of the war delayed publication until now. Doubtless this delay was a disappointment to those scholars involved in the project although the intervening years probably permitted a greater maturity of judgments, possibly some valuable revision and, certainly, as the documentation indicates, the use of various important recent studies on Galvani and his time, all of this, finally, to the advantage of the reader.

The introduction by I. Bernard Cohen presents the reason—if any be required—for this edition. Galvani's *Commentary* is first of all a picture of the scientist puzzled but groping toward the truth, presenting his findings for what they were worth as well as with the thought that later experimenters might use his results as the basis of a continued advancement of the frontier of science. "For after reading our experiments," writes Galvani, "learned and distinguished scholars will not only be able to develop them through their own studies and investigations, but even to carry out other experiments which we may have attempted but perhaps could not bring to conclusion." The ideal was a noble one even though, in the case of Galvani, much of his work had ultimately to be rejected. Nevertheless the *Com-*

[9] May I confess that for years I planned to publish a facsimile edition of that memoir in *Osiris,* but I always lacked the hundred pages that were needed. Dr. Florkin might perhaps include such a facsimile edition in his *Travaux,* but it ought to be annotated and completed by a mathematical mediaevalist.

[10] Good examples given by Jean Haust: *Médicinaire liégeois du XIII^e siècle et médicinaire namurois du XV^e* (Bruxelles, 1941; *Isis,* 1949, *40,* 128, 156).

mentary was a stimulating work, and its study and, indeed, even its rejection were a stimulus of no small value to the more highly rewarded efforts of Alessandro Volta.

Galvani's concern was with the subject of animal electricity. It was a subject which had already been considered in lesser degree in relationship to the general study of electrical phenomena which Professor Cohen very ably and clearly traces from an inception in the writings of Isaac Newton down to the period of Galvani's investigations, with particular emphasis upon the work of Franklin and his relationship to Galvani, directly and indirectly within the bounds of such evidence as exists. Professor Cohen, it may be said, is meticulous in his reliance upon documentary evidence. The later eighteenth century was much concerned with the possible control of nervous action by some sort of electric fluid. Suggestions in this direction are to be found in both Newton's *Opticks* and *Principia*. Boerhaave and Haller directed research toward this subject as well as Leopoldo Caldani, Galvani's predecessor in the chair of anatomy at Bologna, and these men and other forerunners of Galvani paved the way for his observations and finally his *Commentary* which is here available in English and in the original Latin. Galvani's achievements were very largely indirect and unwitting. His experiments and their results "led him to believe that an electric fluid must be in the animal itself and he likened the whole process of a fine nervous fluid flowing from the nerves into the muscles to the passage of electricity in the discharge of a Leyden jar." This animal electricity chiefly secreted in the brain has the greatest afinity to the nerves. Their inner substance conducts this electricity to the muscles which, like a Leyden jar, are negative on the outside and positive on the inside. Hence the mechanism of motion results from the discharge of the muscular fluid from the inside of the muscle by way of the nerve to the outside, "and this discharge of the muscular Leyden jar furnishes an electrical stimulus to the irritable muscle fibres, which therefore contract." The ultimate failure of Galvani's investigations as presented in the *Commentary* resulted to a large degree from his all too rudimentary knowledge of physics from which arose, at least in part, a certain lack of scientific precision in language, data, and concept. While the later demonstration of electrical potentials in muscles and nerves seems possibly to have been a result of a kind of Galvanic stimulation and of vast importance in the field of physiology, Galvani's influence is chiefly recognized through the stimulating effect which his *Commentary* had upon Volta, and from this point of view "Galvani's book can be considered as a starting point for developments in science of the greatest consequence in three major areas of knowledge: physics, chemistry, physiology."

Professor Cohen's fully-rounded, clear, and informative introduction ably supported by a wealth of bibliographical data, is followed by an English translation of the *Commentary* by Dr. Margaret Glover Foley, annotated by Professor Cohen; and immediately thereafter is presented a full-size fac-

simile of the original Latin text. If any fault can be found with this delightful book—and with regret, it must be said—it is in reference to the translation. However, let it first be noted that the translator has ably surmounted the major difficulties of Galvani's lengthy sentences and his own difficulty of expressing modern ideas in an ancient language. Furthermore, it is specifically asserted in the introduction that the translation "has been planned for readability and is, therefore, to some extent free rather than literal," and the effort to present a readable translation has not led to any notable distortion. Nevertheless there are a few instances in which words or phrases have been omitted, and thereby the reader is denied some bits of information. While it is true that these omissions represent minor points, yet presumably this edition will be looked upon as the standard English version of Galvani's *Commentary,* and it is therefore unfortunate that it should be faulty even in this slight degree. On p. 38 there is a curious mistranslation where the phrase *ex.*[*empli*] *gr.*[*atia*] = for example, has been rendered as "through the agency example" which makes no sense at all. On p. 73 Professor Cohen calls attention to a statement of Galvani: "[animal electricity] courses strongly from the muscles to the nerves or rather from the latter to the former," about which he remarks: "The stylistic oddity of this phrase is puzzling; why, if the course of animal electricity is from the nerves to the muscles, did not Galvani say so directly?" To this question it may be replied that there are numerous instances of this indirect presentation in the Latin of the sixteenth century where it represents nothing more than a stylistic conceit, and quite possibly the same is true in this later instance.

In 1936 Drs. John Fulton and Harvey Cushing compiled and published in the *Annals of Science* a bibliography of the writings of Galvani and Aldini on animal electricity. The portion dealing with Galvani, now revised and extended by Dr. Fulton and Madeline E. Stanton, concludes the present volume and makes note of those new editions of the *Commentary* which have appeared in the intervening years, notably translations into Italian, English, French, and Russian, and indicates the present locations of the rarer issues and editions of Galvani's writings, some of which have changed their homes in the past eighteen years. Suffice it to say that the bibliography maintains the high standards which we have come to expect from Dr. Fulton and Miss Stanton.

As publication No. 10 of the Burndy Library the volume under review reflects the high quality set by previous publications in this series in respect to design, typography, illustrations, and the facsimile of the *De viribus electricitatis,* this last from the copy now in the Burndy Library but once presented by Galvani to Volta. This, together with the excellence of its literary content sets a standard which will be difficult to maintain in future publications and an example it is hoped may be emulated by other publishers. It is pleasant to note that this handsome book is dedicated to Owsei Temkin, Professor of the History of Medicine, Johns Hopkins University.

KARL-HEINZ BELOW. *Der Arzt im römischen Recht.* (Münchener Beiträge sur Papyrusforschung und antiken Rechtsgeschichte, 37. Heft), München, C. H. Beck'sche Verlagsbuchhandlung, 1953. xii + 136 pp. RM. 13.

Reviewed by GEORGE ROSEN, *Professor and Head of the Department of Public Health Education, Columbia University, New York, New York.*

THE position of the physician in the legal structure of society is an important aspect of the social history of medicine. Nevertheless this subject has not received the attention it merits from either historians of medicine or historians of law. For this reason, Below's monograph on the physician in Roman law is a welcome contribution to the topic. The study is based on a comprehensive examination and analysis of the significant legal texts containing references to physicians and medical matters.

Below first considers the social status of the Roman practitioners. For the most part they were slaves (*servi*) or freedmen (*liberti*). In rare cases free-born citizens (*ingenui*) practised medicine, but more frequent were physicians from foreign parts (*peregrini*), who were called to Rome from other centers such as Alexandria because of special circumstances, or who migrated to the city because it offered greater opportunities. From the beginning of the Empire, the medical practitioner occupied a privileged position. The development of this legal position is traced from Augustus to the reform of Antoninus Pius. The latter restricted the *immunitos,* formerly granted to all practitioners, to a limited number, five, seven, or ten depending on the size of the city. Most cities had municipal physicians. In addition, there were court physicians and military physicians (*militum medici*) as well as private practitioners.

Having depicted the position of the medical practitioner, Below analyses the social evaluation of medical services as reflected in the juridical structure. Slave practitioners were rented out by their masters, while freedmen operated on a contractual basis. All physicians received a fee, and suits could be instituted to obtain restitution of expenditures for medical care. Practitioners were legally responsible for misconduct in the practice of their art. Malpractice involving homicide was severely punished.

These are only a few of the many fascinating details in the picture drawn by the author. Each topic is discussed on the basis of the texts so that the reader has the evidence before him. The author is to be congratulated on an excellent contribution to the history of medicine as well as to the history of law.

THOMAS FRANKLIN CURRIER and edited by ELEANOR M. TILTON. *A Bibliography of Oliver Wendell Holmes.* New York, New York University Press for the Bibliographical Society of America, 1953. xiv + 708 pp. $20.00

Reviewed by HERBERT S. KLICKSTEIN, *fellow, Institute of the History of Medicine, The Johns Hopkins University.*

THIS biographical and historical bibliography of the writings of Oliver

Wendell Holmes was begun about ten years ago by Thomas Franklin Currier, compiler of the standard bibliography of John Greenleaf Whittier (1937), and was left in manuscript about seventy per cent accomplished on his death in 1946. It now has been completed and edited by Eleanor M. Tilton for the Bibliographical Society of America. Miss Tilton is the author of *Amiable Autocrat* (1947), a biography of Holmes, and it was through working on this book that she first met Mr. Currier who gave her free access to his notes and material. No more appropriate memorial could be provided to his efforts than this volume which has been brought to fruition by Miss Tilton. An earlier bibliography by George B. Ives, published in 1907, contained about one-third of the items available in this study.

The book consists of three parts and then appendices. Part I gives detailed descriptions of the books, pamphlets, leaflets, and broadsides, and includes the few volumes for which Holmes wrote introductions as well as all posthumous publications containing an actual first printing. The first American and British editions of each of his major works are fully collated and discussed; all known reprintings and those with special prefatory comments are more briefly noted, particularly those made by Holmes's own publisher. This section, as in other portions of the book, is replete with references to the publisher's own records and provides such pertinent information as the number printed, bound, distributed, sold, etc.; these data were drawn from the manuscript record volumes of Ticknor and Company, H. O. Houghton Co., Houghton, Mifflin and Co., and the Riverside Press with much of the material now on deposit in the Houghton Library, Harvard University. Covering the years 1830-1947 the primary entries are arranged chronologically with all subsequent printings under its first edition; this deposition is not only convenient but collects in one place the entire history of a book. A concise check-list at the beginning of Part I summarized the contents and facilitates usage.

Part II lists all poems which Holmes is known to have written, both published and unpublished; a number of poems are printed for the first time. All occasions for which Holmes wrote verses are also recorded when ascertainable. The greater number are grouped alphabetically according to title, the remainder by subject or personal name. Information is provided on date of composition, occasion for writing, first printing, and first pamphlet or book publication. Located manuscripts and variant titles are identified. Deleted, however, are references to anthologies, songsters, and school readers. The entire section is elaborately cross-referenced.

Holmes's prose, inclusive of some letters hitherto not known, is indexed by alphabetical title in Part III; newspaper, periodical, and book printings and a number of unpublished writings are listed. The majority of Holmes's notes for his medical studies, reading, and books are referred to but not given separately. The mode of analysis follows that of Part II. No attempt was made to incorporate reprintings of excerpts.

Briefly, the appendices cover the following: (1) Anonymous Poems; (2) Sheet-Music Editions; (3) Star-Spangled Banner; (4) National Anthem Prize Contest, 1861; (5) Popular Lectures; (6) Printed Letters; (7) First Printings in Book or Pamphlet; (8) American Reprints and Editions for the Blind; (9) English Reprints and Foreign Editions; (10) Biography and Criticism. Descriptions and annotations are of the same format as in the earlier divisions but not as extensive and for fewer entries; manuscript sources, correspondence, listings, and other ancillary evidence are incorporated. The printed letters are given as a chronological list only; Miss Miriam R. Small, of Wells College, is editing the letters for publication. Noteworthy are the Josiah Trent holdings of the Mitchell correspondence. Appendix 9, which was compiled completely from Currier's notes and is admittedly incomplete, is primarily concerned with British imprints although a few from Italy, France, Germany, and Japan are included. The "Biography and Criticism" is a comprehensive collection of biographical, bibliographical, and critical references relating to Holmes, contemporary notices of his books, controversies concerning his writings, and additional correlative materials. A concluding "Index" gives ready access to names, titles, and subjects.

This compilation is personalized bibliography in its broadest significance and reveals more about Holmes than any conventional biography; it provides a real basis for evaluating anew the man and his endeavors, not only when and how he started to write, but what he wrote both published and unpublished, what prompted him to undertake each work, and what each encompassed materially and philosophically. Holmes's self-knowledge, diversity of interests, and achievements are fully documented and furnish an insight hitherto unavailable. Extensive information relevant to the history of medicine as well as the history of literature are to be found here. Holmes was at his best as anatomist, teacher, and medical pamphleteer; an index has been supplied to pursue further his position in relation to controversial issues both medical and otherwise. The letters of Holmes when published will be an invaluable adjunct to this bibliography; together they will clarify a number of yet unanswered questions such as the relationship of Holmes and his jurist son.

As with any work of this nature and scope it is impossible to include everything, and assuredly nothing of consequence has been left out. However, the decision to omit the Webster-Parkman trial tracts appears unfortunate, for although they are of little subjective value, they do cover an engrossingly human episode. The paradox of Holmes testifying as both a character witness for the defence and an expert witness for the prosecution is unique, nor should his friendship with the principals be overlooked. A further pursuance of the translations of Holmes's writings would have been of interest. Technically, the volume is irreproachable with the collations and annotations concise and pertinent. A numbering of all entries would perhaps have simplified cross-reference and given in any case a quantitative

measure of Holmes's productivity. The Anthoensen Press, as might be anticipated, has produced a handsome volume. Twenty-five collotype illustrations, a number of them not previously reproduced, supplement the text.

This profound study by Mr. Currier and Miss Tilton is unquestionably definitive.

SIR ZACHARY COPE. *Surgery*. Medical History of the Second World War, United Kingdom Medical Series, compiled under the direction of the Editor-in-Chief, Sir Arthur S. MacNalty, author of the Foreword. London, Her Majesty's Stationery Office, 1953. xx + 720 pp. 80s.

Reviewed by JOHN F. FULTON.

THIS unusual volume which records the response of a great nation to the exigencies of war illustrates effectively how the British marshalled their resources in all phases of surgery to outdistance other countries in this and in the promptness of publishing their war record; it also illustrates the importance of placing the major editorial responsibilities in the hands of the best civilian talent available. The military services have of course, as one would anticipate, contributed admirably, and the inevitable inter-service rivalries in compilations such as this have been ably resolved by Sir Arthur S. MacNalty, the civilian editor-in-chief, a man respected by every branch of the military service and by all civilians in British medicine. When writing a review of a book, it is well not to consult other reviews, but I feel impelled to quote a few lines which appeared about this book in the *British Medical Journal* for 15 January 1954 on page 139: "This volume must surely be one of the greatest records of all time of the art of healing. It is far more than a mere record of surgical skill. It is the story of how a whole nation came to the help of those who had risked their lives in its service, of medical skill without parallel, devoted to those whose courage has never been surpassed."

Having been in close touch with the British medical services throughout the war period, and especially with Sir Arthur MacNalty and Sir Zachary, this reviewer could easily have predicted that the present volume would be more comprehensive and factual than anything we could have put together on this side in recording the activities of our own services—this because of the difficulty of integrating our records—but I was not prepared for the degree of excellence which Sir Arthur and Sir Zachary between them have attained. The general introduction of surgery in wartime by Ogilvie is a modest and most impressive story of the effectiveness and also of the speed with which injuries were handled in World War II as compared with World War I. Porritt, Paterson Ross, and Gordon-Taylor follow with three first-rate chapters on the treatment of war wounds. Sir Lionel Whitby's section on blood transfusion might have been more detailed because he and his team contributed so much in this particular sphere.

It is not possible to mention each chapter, but our colleagues in neurosurgery in this country will be interested in the fact that Sir Zachary him-

self deals with neurosurgery, or at least that part relating to skull and brain, and after paying a handsome tribute to the late Sir Hugh Cairns and his colleagues and to Professor Sir Geoffrey Jefferson he turns to the record of World War I and here pays an equally deserved tribute to Harvey Cushing and his associates such as Gilbert Horrax. The section on spinal cord injuries is recorded by Ludwig Guttmann; indeed, nearly one hundred pages of the book are devoted in scholarly fashion to this phase of wartime neurosurgery. Guttmann begins logically, as one would expect, with physiological and neurological considerations, and includes an excellent section on mechanisms of spinal injury. He emphasizes the importance of quick transportation and early treatment, but he is far more conservative than the majority of American authors on the importance of immediate laminectomy in all cases of spinal injury with severe paralysis, a point which is rather surprising in view of Dr. Guttmann's extensive knowledge of human spinal cord physiology.

The chapter on burns by Cope and Morley is a fine statement, and their general point of view coincides with that of the medical services of nearly all the Allied powers. In short, this is an inspiring book which should be read, and read closely, by the younger generation of surgeons in case they too, overnight, should be called upon to assume surgical responsibilities undreamed of either in the First or the Second World Wars.

In the final chapter on medicine in the prison camps, which should be included in any wartime history, Henry Souttar, in speaking of the work of Julian Taylor and his colleagues in the Japanese prison camp of Singapore, said that they "learned something of the great ideals which have inspired our profession since the days of Hippocrates." Perhaps in the prison camps more than on the battlefronts are the concepts of modern medicine, surgical and otherwise, acutely needed.

I can only repeat that this book is worthy of study by anyone concerned with medicine.

WORLD MEDICAL PERIODICALS. WHO and UNESCO, 1953. [Printed by The Thanet Press, Margate, England], xvi, 237 pp. 12s. 6d.

Reviewed by JOHN F. FULTON.

THIS valuable compilation has been made by Mr. L. T. Morton of the *British Medical Journal* under the auspices of the World Health Organization and UNESCO, and the guidance of the following committee of eight:

Dr. Hugh Clegg (Chairman) (*British Medical Journal*)
Dr. Morris Fishbein (American Medical Association)
Dr. N. Howard-Jones (World Health Organization)
Professor L. Justin-Besançon (*Semaine des Hôpitaux*)
Dr. Isabella Leitch (Commonwealth Bureau of Animal Nutrition)
Dr. Marguerite Lwoff (*Bulletin de l'Institut Pasteur*)
Professor R. V. Talice (Faculty of Medicine, University of Montevideo)
Professor M. W. Woerdeman (*Excerpta Medica*)

Official abbreviations for each of the nearly four thousand journals listed are given according to the code of rules adopted for the *World List of Scientific Periodicals* now in its third edition. *World Medical Periodicals* will be of the greatest possible value to journal editors and librarians, and should be on the desk of every editorial assistant. For the first time a consistent scheme of citation of medical journals is available, and the scheme deserves to be widely adopted. One sincerely hopes, for example, that it will be taken up by the American Medical Association and by the Armed Forces Medical Library whose present practices in abbreviating journal titles are often inconsistent and thus hard to follow. Mr. Morton deserves great credit for having seen the undertaking through, and this journal editor offers him sincere congratulations.

PAUL H. KOCHER. *Science and Religion in Elizabethan England.* San Marino, Calif., The Huntington Library, 1953. xii + 340 pp. $6.00.

Reviewed by KENNETH MACLEAN, *Professor of English, Victoria College, University of Toronto, Canada.*

IN this admirable essay sequence Mr. Kocher persuasively establishes an enlightened Elizabethan age in which religion made liberal accommodation for an active and early science, while science in turn gave respect to the traditions and demands of religion. So agreeable was the religious mind of the Elizabethan age to new scientific theory that we may wonder if in our time we are not seeing the abandonment of science by religion rather than the desertion of religion by science. Mr. Kocher estimates that about two-fifths of the writers on scientific subjects in the Elizabethan period were clerics. While he points out the remarkable degree to which both Catholicism and Calvinistic protestantism were friendly to science, he writes (unlike many historians of the scientific movement) with an Anglican persuasion. England's established churchmen must, on this good testimony, be credited for the advanced start England made in the direction of the scientific society. In the degree that such progress has been humane, we must admire the liberal mind of the English Church, whose clerics in all periods have shown remarkable ability to absorb other studies as well as their divinity. Among Mr. Kocher's many examples, William Bullein, rector in Suffolk and medical writer, may stand as representative of his enlightened profession. Despite the Anglican tendency of Mr. Kocher's argument, I am not sure but that Calvin's liberalism, with the tradition it intimates, is not the most impressive memory left by this study.

While many aspects of the scientific movement come up for consideration in this broad account, Mr. Kocher's chief attentions go to the field of cosmology (so greatly altered by Copernicus in 1543), and also to the subject of physical and mental health (in relation to astrology, demonology, and the well-developed Elizabethan language of the humors). If I am right in feeling that this is the division of topics, I might then expect Mr. Kocher

to have taken some note of the paradox that clerical tolerance seems not to have extended to that region of first clerical interest—the sick soul. In its view of abnormal psychology, the Church kept the dying language of witchcraft and demonology. However, in its approach to the well soul, the Church was taking an enlightened stand against judicial astrology, hostile as this was to the concepts of moral responsibility. And the degree of clerical tolerance to new thought in the field of cosmology was remarkable; and it is brilliantly set forth here in a series of chapters which show how excellently Mr. Kocher can present the history of ideas. In helping to establish a regular and observable natural order—so much the wish of science—we see churchmen taking stands against reviving poetic scepticism, old 'chance' philosophies, and, most remarkably, against the view (poetic again) that nature was in decay—"consumed, effeminated, and worn out." Refuting opinion established by other studies in Elizabethan science, Mr. Kocher says, "My net impression, uttered with all tentativeness, is that decay was not one of the ruling ideas of the Elizabethan period." An undoomed clergy were also helping the enlightened view by shrinking Satan, by arguing that miracles have "long since ceased," and further by allowing allegorical or modified reading for biblical information now rendered obsolete by science, as of waters beyond the firmament. Most surprising is it to find clerical acceptance of the decentering Copernican cosmology. In the traditional Aristotelian-Ptolemaic cosmology, changes of generation and decay belonged only to the sublunary world—"the Globe of Mortalitie"—above which stood the eternities of the planets and fixed stars. The same observations which were confirming the Copernican order were now finding, in the nova of 1572 and in the course of many comets (no longer thought to be easily combustible fatty exhalations), signs of change and flux in the region of the changeless heavens. Here Mr. Kocher is writing exciting and moving intellectual history. "Mutability, the giantess of Spenser's *Faerie Queene,* was rising from the earth to conquer the whole of the created universe." To a remarkable degree the religious mind of the Elizabethan age kept pace with discovery, helped on in good measure by the scientists themselves. Already in 1576 Thomas Digges, following the way of Robert Recorde, was putting Copernicanism firmly in a religious mold, finding a new location for Paradise, formerly placed outside the now dismissed solid *primum mobile.*

Mr. Kocher's Elizabethan scientists were in a sense Emerson's poetic scholars—"men thinking about nature." The religious temperament of these truly liberal scholars is to be seen in such infusion of religion into the new cosmology. The goodliness of the scientific mind is shown to us particularly in the region of psychology. Doctors and their fellow amateurs (English and foreign) were opening up the new field of psychology in a type of book which, we have been increasingly persuaded to feel, was influential upon Elizabethan literature as it became more and more interested in the sick soul. Mr. Kocher has listed (p. 288) some of the authors of this important type of text, of which an anthology would seem to be very much needed.

By Mr. Kocher's use of these texts, the work of the Spaniard Juan Huarte stands out by reason of its showing a more pronounced determinism than was generally characteristic of Renaissance psychological writing. Mr. Kocher finds such medical writing widely infused with religious feeling. He seems to see these early psychologists as preserving the concept of a soul which could stand apart from mental illness—clouded by the experience but not corrupted by it. Similarly he finds such writers generally distinguishing (Bright, Burton, and Wright definitely) between the religious guilt sense experienced by the soul, and the depression of a physical melancholy to be treated physically.

Mr. Kocher presents an Elizabethan society in terms of its tolerance and its accommodations. Indeed his subject is very much that of accommodation —a theme which may in a measure conceal the sharper character of these Elizabethans, and blunt too the style of their historian. However modern the Elizabethans were in their tolerance, we must not be led to suppose that their world view, shared by scientist and divine alike, was also modern. Despite such matters as Gilbert's animate magnetism and his Platonic sense which point to a later "religio-science," the Elizabethans, we guess, observed Aristotelianism, keeping its strongly Christianized sense of order and knowledge. However their cosmology was turned about, an Aristotelian sense of a well-caused order remained, finding its place increasingly in the types and species of things. Mr. Kocher observes and demonstrates that the Elizabethan churchman thought that Aristotle has described "the natural." With Aristotle, too, the Elizabethan, scientist and cleric alike, believed in the fact of knowledge, in the knowability of things. "Elizabethan astronomers, medical men, chemists, psychologists toiled and wrote their books in the faith that they were discovering and describing the real facts of nature." To a society which has made a symbol of Ahab and his violent slashings against the wall of the unknown, the Elizabethans would seem to have had an easy time of it. An interesting part of Mr. Kocher's study is the information he gives us here and there about the Elizabethan's confidence in the truth of sense knowledge. And he touches interestingly upon the background of this confidence in writing as varied as that of Augustine, Aquinas, à Kempis, and Calvin. The fall of man, however shattering, did not make rtuth unavailable to the senses. ". . . Original sin . . . only partially darkened the profound understanding of natural science that Adam had in Eden." Bacon was an Elizabethan in these terms. Experimental scientist that he was, he held to the knowability of all that knowledge which he took as his province. ". . . When the human mind has once despaired of finding truth," he wrote, "Its interest in all things grows fainter."

This is not our later world view. And when Mr. Kocher at the end of his study uses a certain measure of exhortation in praising things Elizabethan, we may wonder if he is not indulging an Aristotelian nostalgia. We have lost such order and such knowledge. The post-Elizabethans, who produced our culture, proceeded without Aristotle and indeed against him.

They came forward, we may guess, out of the conflicts of an improved school and university classroom. For Aristotle's knowledge they substituted utility and Glanvill's brand of scepticism. They ruled out knowable order and essences and species. They exiled man from Eden into a world of sensations and images and secondary qualities. They found 'the imagination'—at first only an unwanted by-product of their utility—but later the way for poetry and religion, the way for Shelley and Wordsworth, for Emerson and Whitman. Here now and in our time is something to applaud, as well as that old Elizabethan-Aristotelian order. In some measure we detect in Mr. Kocher's language an hostility to the imagination, perhaps especially in his implication that mysticism is averse to science. This attitude may in a degree make difficult the general relating of the Elizabethan literary mind to the materials of this study. It may also tell against Mr. Kocher's style in places.

In ranging across Elizabethan opinion about subjects as varied as mineral baths and curiosity, Mr. Kocher provides a great deal of page-to-page interest. His later pages of medical history show a fine detail, while central essays on miracles, Satan, and the new cosmology are rich in exact information. His Elizabethan titles, many provided by the Huntington Library which publishes this book, are of the first water—works by Nausea and Texeda and Valleriolus and Blundeville and many other little-known writers. Footnotes are interesting, too, for their many titles of books and articles in the field of ideas, so many of them the work of the last twenty years. With the footnotes so rich, one could wish that the index were more regular and more extensive. Mr. Kocher's own essays are unentered here. One finds the occasional bibliographical slip, as, for instance, in the handling of the titles and dates of Robert Parsons' works. By way of bibliographical criticism one may remark that throughout the study there is a certain bibliographical discontinuity, as different divines and different scientists are called in to illustrate different ideas. One notices, too, a rather too easy crossing of language borders. One wonders about the exact circulation of many of these titles. And now finally, a wish and a query. One wishes for more information about the Raleigh "school of atheism" which makes brilliant flashes in Mr. Kocher's text. And one queries the absence of Shakespeare material. There is but one Shakespeare reference, and this very near the last page: "More needs she the divine than the physician." Shakespeare needs the historian of ideas.

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